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TROPICAL DISEASES BULLETIN

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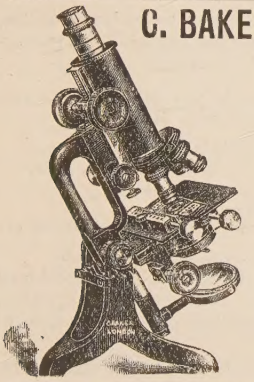

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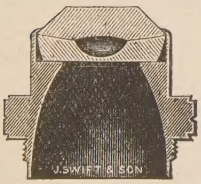

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TROPICAL DISEASES BUREAU.

TROPICAL DISEASES BULLETIN.

Vol. 8.] 1916. [No. 1.

KALA AZAR.

NICOLLE (Charles). **Chronique du Kala-Azar en Tunisie.**—*Bull. Soc. Path. Exot.* 1916. Mar. Vol. 9. No. 3. pp. 126–129. With 1 fig., and *Arch. Inst. Pasteur de Tunis.* 1916. April 1. Vol. 9. No. 3. pp. 176–179.

In continuation of his paper in the *Bulletin de la Société de Pathologie Exotique*, June 1914 [this *Bulletin*, Vol. 4, p. 394] the author records the occurrence in Tunis of seven further cases of kala azar in children. Thirty-eight were previously chronicled so that the total number observed by him in eight years is 45. The disease is unknown below the age of six months and above ten years. It is commonest from the first to the third year (27 out of 45 cases). Boys are more frequently affected than girls (28 boys, 17 girls). Italians predominate (35 cases out of 45).

Referring to cultures of leishmania the author remarks that a culture of *L. tropica* isolated in November 1909 was found to be contaminated by a bacterium at its 135th subculture. This was kept going for 21 further subcultures. The growth of the parasite was normal and abundant in spite of the contamination as long as the temperature was maintained at 18 to 20°. But when the temperature was raised the bacteria gained the supremacy. The leishmania were regained in a state of purity by a human inoculation.

The author again calls attention to cases of anaemia with enlargement of the spleen in children, symptomatically similar to kala azar but in which spleen puncture shows neither leishmania nor other parasites. He points out that the number of cases observed is about equal to those of kala azar, that, in contradistinction to this disease, it may occur below the age of six months and that the spleen is markedly hard. This hardness may be apparent on palpation, but is very evident on puncturing the organ, on account of the resistance offered to the needle. The majority of patients are non-Italians, the reverse being the case in kala azar. The prognosis is less unfavourable than in the latter disease, the majority appearing to recover.

E. J. Wyler.

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BOUILLIEZ (M.). **Un cas de kala-azar infantile au Moyen-Chari (Territoire du Tchad).**—*Bull. Soc. Path. Exot.* 1916. May. Vol. 9. No. 5. pp. 299–302. With 1 fig.

This is an account of a case of kala azar in a native child, about six years of age. It was probably infected in the Chad (West Africa) district and is of interest as the first one recorded in that locality. No spleen puncture was made, but the parasites were found in large mononuclear cells in the peripheral blood.

E. J. W.

i. ARAVANDINOS (Anast.). **Contribution à l'historique de la leishmaniose interne.**—*Bull. Soc. Path. Exot.* 1916. Jan. Vol. 9. No. 1. pp. 10–13.

ii. LAVERAN (A.). **Au sujet de l'historique de la leishmaniose viscérale.** —*Ibid.* Feb. No. 2. pp. 74–75.

i. The author, writing from the University of Athens, claims that kala azar was described as a clinical entity in Greece, several decades before accounts of the disease in India were published.

In support of this contention he points out that in 1835 a Greek physician reported the existence of splenomegaly in children in the island of Spezzia, and that other cases have since been reported from there and from the island of Hydra.

ii. This paper is a reply to the above claim. It is remarked that confusion may have occurred between cases of enlarged spleen not due to leishmania and cases of kala azar and that there have been reported from Greece by Dr. ARAVANDINOS (and from Tunis by Dr. NICOLLE) cases of splenic enlargement, identical with infantile leishmaniasis but not due to *L. donovani.*

He remarks that it is the discovery by LEISHMAN and DONOVAN of *Leishmania donovani* which has enabled the history of the splenomegalies to be elucidated and has established a morbid entity characterised by the presence of their parasite.

He concludes by justly stating that the discovery of visceral leishmaniasis must be attributed to LEISHMAN and DONOVAN and that it can only be *inferred* from the work of the Greek physicians that the disease has probably been rife, in the past, in the islands of Hydra and Spezzia.

E. J. W.

ARAVANDINOS (Anast.). **L'anatomia patologica e l'istopatologia di un caso greco di leishmaniosi interna.** [Anatomy and Histopathology of a Case of Internal Leishmaniasis from Greece.]—*Malaria e Malat. d. Paesi Caldi.* 1916. Apr. 20. Vol. 7. No. 2. pp. 79–83.

Notes of the post-mortem examination of a child who died from leishmaniasis, presenting nothing of general interest. There has been, however, only one previous record of a post-mortem from Greece, which is the excuse for publishing this one.

J. B. Nias.

MARTINEZ (Fidel F.). **El Kala-azar infantil en lo peninsula Iberica.** [Infantile Leishmaniasis in Spain.]—*Arch. Brasileiros de Med.* 1915. Nov. Vol. 5. No. 11. pp. 392–422.

Infantile leishmaniasis has only been recognised in Spain during the last few years, having been first described by PITTALUGA in 1912. Following up the discovery, the author of the present paper has been searching for fresh cases in that part of the Iberian peninsula which is nearest to the Algerian coast, namely, the territory comprised between the foothills of the Sierra Nevada and the coast-line between Malaga and Almeria. Cases of the disease are found to be common in this region. The inhabitants, on account of their poverty, are in the habit of migrating, with their families, in search of work and in this way the disease has probably been imported into Spain. Many of them also go to South America with the same object, so that there is every probability that ultimately infantile leishmaniasis will be introduced into Brazil through this channel. The greater part of the paper is taken up with a systematic account of the disease, for the benefit of Brazilian practitioners who are as yet not practically acquainted with it.

J. B. N.

i. ROGERS (Leonard). **Preliminary Note on the Treatment of Kala-Azar by Tartar Emetic Intravenously, and Inunctions of Metallic Antimony.**—*Indian Med. Gaz.* 1915. Oct. Vol. 50. No. 10. pp. 364–365.

ii. —— & HUME (N. H.). **The Treatment of Kala-Azar (Indian Form) by Tartar Emetic Intravenously and by Inunctions of Metallic Antimony.**—*Brit. Med. Jl.* 1916. Feb. 26. pp. 301–303.

iii. MUIR (E.). **The Treatment of Kala-Azar with Tartar Emetic.**—*Indian Med. Gaz.* 1915. Oct. Vol. 50. No. 10. pp. 365–368.

i. The author records his general impressions of the treatment, derived from an experience extending upwards of four months.

The result in all cases which had been under treatment for more than two months are summarised as follows :—

Results in Cases under Treatment for over Two Months.

Cases.		Complications.
Much improved	6	
Improved	2	Cancrum oris 1.
No change	1	
Worse	3	Cancrum oris 2, bacillary dysentery 1.
Died	1	Ascites, dysentery, and broncho-pneumonia.

"When it is taken into account that the class of cases admitted to hospital are usually in a very advanced stage of the disease and the frequency of serious complications in the series these results are distinctly promising."

In all cases the diagnosis was verified by spleen puncture. The action of the drug is considered to be probably on the parasites themselves and therefore specific.

In young children, inunctions of five per cent. finely divided metallic antimony in the form of an ointment were tried on account of the disadvantages of the intravenous route. The author does not consider his observations upon this method to be sufficiently advanced to justify conclusions. He suggests that Trixidin (antimony trioxide) might be similarly used as it is said to have been beneficial in sleeping sickness.

ii. Six unselected cases of kala azar in Europeans treated by intravenous injections of tartar emetic are recorded. Parasites were found by spleen puncture in all.

The technique of the injections and dosage was as follows :—

"The technique of the injections is very simple. A 10 ccm. serum syringe is used, and the vein selected—usually either the median basilic or cephalic, or a prominent vein in the forearm—is made to stand out by tying a bandage round the upper arm, and by the patient clenching his fist. Tr. iodine is used to sterilize the skin. As soon as it is thought that the needle is in the vein the piston is withdrawn slightly, and a little blood is drawn up into a syringe; or, if a syringeful of the solution is to be given, the barrel is removed from the needle and a few drops of blood are allowed to flow before the solution is injected. Great care should be taken that the injection is made into the vein, and not into the tissues around the vein. The tartar emetic solution is very irritating, and a few minims injected under the skin cause great pain at the time of the injection, and later on a hard, tender, brawny swelling, or even sloughing of the tissues.

"The symptoms which follow the injections have varied in different cases. Three patients had no untoward symptoms—one experienced a metallic taste in his mouth for several hours, a disinclination for food and vague abdominal discomfort. Another had a severe paroxysm of coughing and vomiting, which came on immediately after the injection, and lasted about ten minutes."

The dosage was as follows :—

"We began with only half to 1 ccm. of the 2 per cent. solution, but rapidly increased it to 3 or 4 ccm. and repeated the injection every two or three days, adding 1 ccm. at each injection up to a maximum of 10 ccm. if the patient had no marked gastric disturbance, in which case the dose may be reduced slightly for a time. In no case have any serious symptoms developed, although we have repeatedly given the large dose of 20 cg."

The authors unhesitatingly advise the use of intravenous injections of tartar emetic as a routine method of treating kala azar ; with the exception of one of the patients, whose case was complicated by tuberculosis of the lungs and intestines, there was uniform and rapid improvement.

"The treatment should be continued until the temperature has remained normal for several weeks with steady gain in weight, and the parasites are found to have completely disappeared from the spleen, and the leucocytes have been raised to about the normal level. It is not necessary to continue until the spleen has been reduced to its normal size, as it will continue to shrink after the injections are omitted.

"In children and nervous female patients inunctions of antimony ointment, preferably in a strength of 10 per cent., is worthy of trial, although there is not yet sufficient evidence to decide how far this much simpler measure can be relied on. If further experience shows it to be able to cure the disease it will present manifest advantages, especially in out-patient and village practice.

"We believe that in tartar emetic, and probably in other preparations of antimony, a specific treatment for the terrible lingering and very fatal kala azar has at length been found, and yet another serious tropical disease been brought within the pale of curable affections."

iii. The author was led by the publication in the issue of this *Bulletin* for April, 1915, of a review of an article by G. di CRISTINA and G. CARONIA upon the treatment of infantile kala azar by intravenous injections of tartar emetic to try this treatment in adult cases. After trying the method in nine cases in which the diagnosis was confirmed by spleen puncture he came to the conclusion that it is "undoubtedly a specific for the form of kala azar found in the Hooghly and Burdwan Districts."

All the cases (which are fully described), with the exception of one admitted to hospital in the last stages of the disease, were either cured or showed marked improvement from the commencement of the injections.

The author remarks that he would have preferred to wait before publishing this article until cases had been collected which had stood the test of a year's time without recurrence, but as the results of the injections were so encouraging he considers that this form of treatment should be made widely known at once.

Intramuscular injections of turpentine were given in conjunction with the tartar emetic, as they were found to increase the rate at which the spleen diminishes.

"The turpentine injection consists of a solution of turpentine one part in camphor-creosote one part of each and olive oil two and a half parts. Of this up to ten minims is injected into the muscles of the back on either side of the body.

"I have invariably noted that if such an injection is given to a patient at all advanced in the disease before the tartar emetic treatment is begun there is little or no reaction and swelling.

"If, however, it is given after a week's treatment with tartar emetic, there is a very marked reaction, the part injected swelling and causing considerable pain. Spleen punctures taken at a week's interval show first marked diminution and then complete disappearance of the parasites."

The author's observations lead him to conclude that while the turpentine injections are not absolutely necessary to recovery, it would be delayed without them.

E. J. W.

RAI U. N. BRAHMACHARI BAHADUR. i. **A Preliminary Report on the Treatment of Kala-Azar with Intravenous Injection of Metallic Antimony.**—*Indian Med. Gaz.* 1915. Dec. Vol. 50. No. 12. pp. 455–457. With 1 fig. & 6 charts.

ii. **Further Observations on the Treatment of Kala-Azar and Cases treated with Metallic Antimony, Antimonyl Sodium Tartrate, Formaldehyde and Other Drugs.**—*Ibid.* 1916. Jan. Vol. 51. No. 1. pp, 16–19. With 3 charts.

i. In the first paper the author reports the immediate result of treatment by metallic antimony in five cases which had been diagnosed by the presence of Leishman-Donovan bodies in the spleen. Three or four injections of ½–1½ grains were made in each case at intervals of a few days.

Temperature charts are shown in all cases, and also tables giving changes in the blood, body-weight, and size of spleen ensuing upon treatment. The author says, "So far the results are encouraging and justify further investigation. No untoward results, such as plugging

of the capillaries have followed the intravenous injection of metallic antimony. Sometimes the patient suffered from rather severe diarrhoea, which however stopped in 24 to 48 hours."

The apparatus for injection is illustrated and full details of the technique are given.

ii. In the second paper it is shown that the improvement in the cases had continued up to date, and details of another successful case are given. The author also describes the result of treatment with intravenous injections of galyl, formaldehyde, PLIMMER's salt (antimonyl sodium tartrate), tartar emetic and antim. sod. tartrate, tartar emetic and other drugs combined (berberine sulphate, nuclein capsules, galyl). His conclusions are as follows :—

"(1) So far as the above cases go to prove, metallic antimony seems to produce very marked beneficial effects in kala azar, and the effects tend to be permanent.

"(2) The soluble salts of antimony, such as tartar emetic and antimonyl sodium tartrate, are also very beneficial in the treatment of the disease.

"(3) Metallic antimony introduced into the circulation remains in the spleen and the liver for a much longer period than when introduced in the form of soluble salts. It may be therefore expected to give rise to more marked and permanent results. Not more than five injections have been given to any of my cases. It appears that not more than three or four injections are required to bring about what appears to me a permanent cure.

"(4) The results obtained from combining antimony treatment with other drugs such as galyl, berberene sulph. and nuclein, do not, so far, seem to differ from what follows the treatment with tartar emetic itself.

"(5) Galyl has been tried in four cases without any effect, but evidently it must be given a further trial before its effect can be determined.

"(6) One remarkable case of recovery has been recorded following intravenous injection of formaldehyde.

"(7) Attempts are being made to prepare a colloidal solution of metallic antimony, and if this succeeds, the colloidal solution of the metal will perhaps be the ideal preparation of antimony to be adopted in the treatment of kala azar."

E. J. W.

RAI HARINATH GHOSH BAHADUR. **The Speedy Recovery of a Case of Kala-Azar by Intravenous Injection of Sodium Antimony Tartrate with Sodium Cinnamate and Berberine Hydrochloride.**—*Calcutta Med. Jl.* 1916. Jan. 6 pp. With 2 charts.

The solution used for injection was as follows :—Sodium Antimony Tartrate, 1 gm. ; Sod. Cinnamate, 2 gm. ; Berberine Hydrochlor., 1 gm. ; Dist. water, 100 cc.

Treatment was commenced with 0·5 cc. (=0·5 cg.) the dose being gradually increased up to 12·5 cg. when vomiting occurred. Twenty-one injections were given in a period of four weeks.

The patient was in good health two months after cessation of treatment. Parasites had disappeared from the spleen twelve days after the injections were begun.

E. J. W.

JEMMA (R.). **La cura specifica della Leishmaniosi nei bambino.** [The Specific Cure of Leishmaniasis in Children.]—*Pediatria.* 1916. Jan. Vol. 24. No. 1. pp. 1–5.

A brief report, without any details, of the successful treatment of 26 cases of leishmaniasis in children with solution of tartar

emetic. Of the 26 children 21 were completely cured, while the remaining five died of intercurrent affections. From the post-mortem examination of the tissues of two of the dead children, Professor PIANESE concludes that the drug acts purely as a specific poison of the Leishman body. The action begins with a plasmolysis of the cell-body goes on to a nucleo-lysis, and finally the blepharoplast disappears. This action is first manifested in the endothelial cells of the vessels of the liver, and then in the cells of the bone medulla, and finally in the spleen.

J. B. N.

CARONIA (G.). **L'impiego di nuovi preparati di antimonio per via intramuscolare nella cura della Leishmaniosi infantile.** [The Employment of New Preparations of Antimony in Intramuscular Injections for the Cure of Infantile Leishmaniasis.]—*Pediatria.* 1916. Feb. Vol. 24. No. 2. pp, 65–81.

An account of the treatment of four cases of leishmaniasis in young children with a new organic compound of antimony termed Acetyl-p-aminophenyl-stibiate of sodium, furnished for trial by the chemical firm of Heyden. The salt in question is easily soluble in distilled water, and contains 38·5 per cent. of antimony. The solution alters with time, and should therefore be freshly prepared for use. It should always be injected intramuscularly, preferably into the gluteal muscles, and never subcutaneously. The dose varies with age. Generally with children under two years of age one should commence with a dose of 3 centigrammes, ending with a maximum of 10 centigrammes, while with children over two years the dose should range from 5 to 15 cgm. Even the dose of 15 cgm. is more than is necessary, and may cause pain and inflammation. The injections should be made at the rate of one every alternate day, and in each buttock alternately. In very thin and ill-nourished children, endovenous injection should be substituted for injection into the buttocks.

Case I. A boy aged three and a half years, ill for six months with irregular fever, wasting and enlargement of the abdomen. Spleen and liver much enlarged. Much anaemia. Splenic puncture showed Leishman bodies. The child got quite well after a three months' course of treatment, the total quantity of the drug injected amounting to 3·60 grammes. No untoward symptoms were produced.

Case II. A girl, aged 23 months, attacked at the age of 17 months with characteristic symptoms of leishmaniasis. Spleen and liver enlarged, while splenic puncture showed Leishman bodies. Rapid cure in 16 days with 9 injections given on alternate days, the dose ranging from 7 to 15 centigrammes of the drug. The number of red cells rose during this period from 1,400,000 to 3,000,000 per cmm., and the haemoglobin from 33 to 60 per cent. of the normal. No Leishman bodies were found by splenic puncture at the conclusion of the treatment. The child was afterwards seen, and showed continued improvement.

Case III. Girl, aged 12 months. Symptoms of five months' duration. Treatment as in the two preceding cases. After the fourth injection of 12·5 cgm. an abscess appeared in the buttock and the dose was reduced to 10 cgm. for the two following doses. Six injections in all were given, in a period of 10 days. The child was seen about a month after leaving the hospital, when the result of a splenic puncture proved negative. Red cells 2,800,000 per cmm. at the beginning of treatment, and 4,570,000 at the end. Haemoglobin 50 and 88 per cent. respectively.

Case IV. Boy, aged 17 months. This child had an abscess in the lumbar regions on its admission to hospital, and eventually died from its extension. It presented, however, concomitant symptoms of Leishmaniasis, and so was submitted to treatment as described. While Leishman bodies were abundant in the spleen at the commencement of the treatment, very few were found at the end. The child received eight injections in all, before death.

The author considers that these four cases demonstrate that the organic compound of antimony mentioned is an efficient specific for infantile leishmaniasis.

J. B. N.

BASILE (Carlo). **Leishmaniosi interna.** [Leishmaniasis of the Internal Organs.]—*Annali d'Igiene.* 1916. Apr. 30. Vol. 26. No. 4. pp. 248–268. With 6 figs.

A systematic account of internal leishmaniasis, bringing the subject up to date, but not containing anything very novel. At the end of this paper, however, the author mentions an interesting observation by BASILE with regard to infected dogs. Having bought up and killed the greater part of the infected dogs in a certain township (Bordonaro) which was a focus of infantile and canine leishmaniasis, no fresh case of the disease occurred in the following year, and only one in the year afterwards, whereas in the year in which the dogs were killed, there had been as many as seven new cases of infantile leishmaniasis, in a population of 2,000 inhabitants.

J. B. N.

LIGNOS (A.). **La leishmaniose canine à Hydra.**—*Bull. Soc. Path. Exot.* 1916. May. Vol. 9. No. 5. p. 302.

The author examined 48 dogs in the Island of Hydra for presence of leishmania, during the warm season (May–October) 1912. Eight (=16·66 per cent.) were found to be infected.

He examined 78 during the cold season (October–April) 1914–15, and found 7 (=8·97 per cent.) infected.

He concludes that the infection is twice as heavy in the hot as in the cold season.

E. J. W

PORCELLI-TITONE (F.). **L'azione antiriproduttiva dei raggi ultravio letti studiata sui protozoi (Leishmanie).** [The Anti-Reproductive Action of Ultra-Violet Light on Leishman Bodies.]—*Pediatria.* 1916. Mar. Vol. 24. No. 3. pp. 147–151.

Leishman bodies from cases of infantile and canine leishmaniasis, from 6 to 10 days' old, were suspended by the author in a mixture of condensation water and salt solution and exposed, in sterile quartz tubes, to the light from a Haeraens mercury-vapour lamp (tension 75 volts), at a distance of 25 centimetres from the lamp. At intervals of so many minutes, specimens were removed for examination in a hanging drop, and also planted out. The authors found, as a result, that an exposure to light, insufficient to kill the organisms outright, will be sufficient to prevent their multiplication.

The tabulated figures are as follows :—

1. Leishman bodies from the child, 10 days' culture. Exposures, up to 10 minutes, to the light affect neither reproduction nor mobility. Exposures from 10 to 20 minutes inhibit reproduction altogether, and diminish mobility slightly. Exposures between 20 and 40 minutes diminish mobility still more, while with more than 40 minutes exposure mobility disappears altogether.

2. With Leishman bodies from the dog, eight days old, the results are the same, except that mobility ceases with exposures over 30 minutes.

In cultures with organisms of which the mobility is only diminished, the bodies will continue to show signs of life, indicated by movement, for from one to seven days, according to the length of exposure, but no further signs of multiplication will appear.

J. B. N.

SUTHERLAND (W. D.) & MITRA (G. C.). **The Wassermann Reaction in Malaria, Kala-Azar and Leprosy.**—*Indian Jl. Med. Res.* 1915. Apr. Vol. 2. No. 4. pp. 984–989.

The part of this paper which deals with kala azar is as follows :—

"We were able to examine the blood of 38 cases of kala azar. In all of these the parasite had been found, by careful and competent observers, in smears taken from splenic material obtained by puncture. Of the 38 cases 10 gave a positive and 28 a negative reaction. Of the 10 positive cases only two gave a more than slightly positive reaction. As to the work of other observers of this disease we can unfortunately say nothing, for up to July 1914 the literature is silent on this point."

E. J. W.

MAGGIORE (Salvatore). **Contributo allo studio della patogenesi dell' anemia nella Leishmaniosi interna.** [A Contribution to the Study of the Origin of the Anaemia in Internal Leishmaniasis.]—*Malaria e Malat d. Paesi Caldi.* 1916. Jan. Vol. 7. No. 1. pp. 18–20.

A short research directed to ascertaining the presence of haemolysins in the blood of cases of leishmaniasis. The result was negative in the six children examined. The serum was incubated for an hour in the thermostat at 37° in different proportions, with a 5 per cent. suspension of washed red corpuscles in physiological salt solution, and also with unwashed blood taken directly from the vein in order to eliminate the possible influence of the salt solution. The conclusion is that the anaemia of leishmaniasis is due to alterations in the tissue of the bone medulla.

J. B. N.

LAVERAN (A.). **Infections expérimentales de la souris par la *Leishmania tropica*; un cas d'infection par la voie digestive.**—*C. R. Acad. Sci.* 1916. Jan. 31. Vol. 162. pp. 187–190.

The author commences by summarising his work upon the experimental infection of mice with *L. tropica* by the intraperitoneal route [this *Bulletin*, Vol. 4, p. 401, Vol. 5, p. 277, Vol. 6. p. 230].

Up to the present time he has passed the infection successively through five mice. Of 36 mice inoculated intraperitoneally or subcutaneously 21 developed cutaneous or subcutaneous lesions without general infection; nine developed cutaneous or subcutaneous lesions with general infection (for the most part mild); none developed general infection without cutaneous or subcutaneous lesions; six remained uninfected.

Of 47 mice inoculated with the virus of Indian or Mediterranean kala azar none developed skin lesions.

The greater part of the paper is occupied with the description of a case of successful infection of a mouse with *L. tropica* by the alimentary tract. A male white mouse, kept isolated in a jar and free from fleas, was fed upon cultures of *L. tropica* on the following dates:—5, 9, 14, 19, 25 May, 1, 6, 23 June, 1915. Four or five drops of a culture were instilled on each occasion into the mouth by means of a pipette, minute precautions being taken against injury to the mucosa. On the 24th January the left hind foot was seen to be swollen, chiefly at the level of the tarso-metatarsal articulation. The skin was red and finely injected and light pressure produced movements indicative of pain. The animal dragged the foot after it.

The subcutaneous tissue at the level of the affected articulation was punctured and smears were made. These showed numerous leishmania. On the 31st January the swelling had increased, but there were no other lesions and there was no testicular swelling.

Of three other mice which were similarly fed, one which died five months after the first ingestion showed no trace of infection. The two others, which are still alive, do not appear to be infected.

The author remarks that this is the first example of infection of an animal with *L. tropica* by ingestion of culture, and that two cases of such infection of monkeys by *L. donovani* are known.

E. J. W.

LAVERAN (A.). **Leishmaniose cutanée expérimentale chez les macaques et chez le chien. Conditions de l'immunité.**—*Bull. Soc. Path. Exot.* 1916. Apr. Vol. 9. No. 4. pp. 265–275. With 1 plate.

The following method of inoculation has been adopted by the author as it has the advantage of being perfectly reliable and of being associated with a short incubation period.

The site of election is the outer surface of the thigh. The skin is here less vascular than on the head and there is therefore little bleeding while, even in small animals, there is plenty of adjacent space left for reinoculation. [In the experiments described dogs were sometimes inoculated at the base of the ears.] The skin is shaved and washed with peroxide of hydrogen. Three punctures are made obliquely through the entire thickness of the skin at a distance from one another of at least 1 cm. When the bleeding, if any, has ceased, a particle of tissue from a mouse infected with *L. tropica* is introduced to the bottom of each puncture.

In two *Macacus rhesus* thus inoculated the incubation period was ten and eight days, typical lesions being produced. In one of the animals the duration of the lesions was 80 days, in the other 60 days. Both showed leishmania in great numbers. The parasites diminished

rapidly as soon as ulceration commenced, a phenomenon which agrees with the well-known fact that they do not readily survive in the presence of bacteria. It is probable that microbic invasion plays a part in the healing of Oriental sore.

Having established a reliable method of inoculation, the author proceeded to investigate the question of immunity.

The experiments were conducted with dogs, as during the last two years it has been difficult to obtain monkeys. The material used was obtained from infected mice. The first two dogs were inoculated successfully at the first attempt. The lesions persisted for three months and for 79 days respectively. They were successfully reinoculated after the lesions had been healed approximately one month. The lesions persisted for 46 and 56 days respectively. These two experiments show that the second attack was less severe than the first.

In the third and fourth experiments now to be described the first inoculation was negative after an interval of one month. The inoculation was then repeated at another site with a positive result both at the new and at the original sites.

In the third experiment a result similar to the two above described was produced, the first and second infections lasting 89 and 37 days. But now a third inoculation was made 21 days after the lesion produced by the second inoculation had healed. There was a slight local reaction which subsided so rapidly that no search could be made for parasites. The conclusion arrived at was that, at the time, immunity was established.

In the fourth experiment six inoculations were made. The first infection lasted 95 days. The second inoculation, made more than two months after the lesions had healed was successful. The lesions persisted for 38 days. A third and fourth inoculation were then made, respectively 5 and 63 days after the lesions produced by the second inoculation had healed. After the third, there was a slight local reaction but no parasites were found on puncture. The result of the fourth inoculation was entirely negative. A fifth inoculation, however, made 109 days after the lesions of the second inoculation had healed gave a positive result. The parasites were scanty in number. The lesions persisted for 48 days. A sixth inoculation made one month after the lesions produced by the fifth inoculation had healed also gave a positive result, with leishmania in fair numbers. The lesions persisted for 43 days. The author remarks that while it may be said that the recurrences were due to the powerful doses employed, the use of feeble doses is fraught with the risk that a negative result may be produced even in susceptible animals, and he further points out that second attacks following natural infection of Oriental sore in man are not uncommon.

He draws the following conclusions from his experiments :—

1. Using material from mice infected with *L. tropica*, lesions containing large numbers of parasites can be produced with certainty in *Macacus rhesus* and dogs.

2. Immunity is sometimes established after successful inoculation. In dogs, a second attack is usually produced by reinoculation practised after the first lesions have healed. The lesions, though characteristic, are smaller and less persistent than in the first attack.

3. After the second attack, immunity is usually established and inoculation produces only abortive lesions. But even after one or two negative inoculations, characteristic lesions may be obtained when some months have elapsed since the healing of the results of the second inoculation.

E. J. W.

TOWNSEND (Charles H. T.). **The Insect Vector of Uta, a Peruvian Disease.**—*Jl. Parasit.* 1915. Dec. Vol. 2. No. 2. pp. 67–73. With 4 figs.

The first part of this paper is taken up with the discussion of the probable relation of uta to other diseases of a similar character occurring in South America.

The author, writing from the Bureau of Entomology, Washington, considers that the uta of the western face of the Andes is distinct from the *espundia* of the eastern slopes, and from the *bouba* or oral leishmaniasis of southern Brazil and northern Paraguay, and that in the absence of tubercular complication it is not a more serious affection than oriental sore to which it is very closely allied.

Dr. A. L. BARTON of Lima is stated to have been the first to arrive at a correct diagnosis of uta as dermal leishmaniasis. He believed the organism seen by him to be identical with that of oriental sore and did not therefore publish the notes he made in 1910 recording his observations, and which he showed to the author. Since that time the author has seen leishmania in smears from uta lesions made by various Peruvian investigators so that the nature of the affection has now been, in his opinion, abundantly demonstrated.

The second part of the paper consists of a description of the author's investigations with specimens of *Forcipomyia.* The ground up products of 27 *Forcipomyia utae* were injected into the ventral region of a guinea-pig. In smears made from the resulting sore, leishmania were found, and also in smears made from the ground-up bodies of four gnats of the same species and from the same lot as were used for the injection. Longitudinal sections were also made of *Forcipomyia townsendi.* These showed numerous leishmania in the abdominal region, apparently only in the gut and none were to be seen in the thoracic region or head. Figures of the Leishman bodies seen in the smears and sections are shown.

The author is of opinion that the organism is voided by the insects from the anus while feeding, that infection occurs when the bites are rubbed, and that as it exists in no form that can reach the salivary glands or proboscis there is no other possible method by which it can be transmitted by biting insects.

The geographical range and seasonal prevalence of uta correspond with the distribution and season of greatest prevalence of the fly.

Two cases, diagnosed as uta, are cited, in one of which, according to the author, the infection was certainly and in the other, probably, traceable to the bites of Forcipomyiae. Unfortunately the lesions were in neither case microscopically examined. The paper concludes with the following paragraph and summary :—

"In conclusion, attention should be called to one important point. As late as 1915, investigators of leishmaniasis have questioned whether the specific organism is not really a stage in the development of a *Crithidia*

or *Herpetomonas* normally confined to the gut of insects, normally conveyed from insect to insect, and only accidentally transferred to man. In the present case the fact that most species of *Forcipomyia* are normally insect-biters, attacking caterpillars and certain other insects, would tend to confirm this view. *Forcipomyia utae* and *townsendi* are very abundant at times during the humid season. It may easily transpire that these gnats, while normally confining their attacks to other insects, have become accustomed, during their periods of greatest abundance, to transfer their attacks to man, due to a shortage of food-supply in the insect fauna requisite for the needs of their increased numbers.

SUMMARY.

"(1) The disease known as *uta*, occurring on the west face of the Andes in Peru, has been proved to be due to a *Leishmania*.

"(2) Two species of *Forcipomyia*, native to the western Andean region, appear to be proved capable of transmitting the *Leishmania* of *uta*.

"(3) It is highly probable that the various forms of leishmaniasis thus far known are due to as many species of herpetomonads originally parasitic in the gut of the insect-carriers concerned, and that, with regard to the occurrence in man, these herpetomonads are as yet in the stages of parasitism ranging from habitually abnormal or frequent to merely accidental or infrequent."

E. J. W.

ESCOMEL (E.). **Contribution à l'étude de la Leishmaniose américaine (Laveran et Nattan-Larrier). Formes et variétés cliniques.**—*Bull. Soc. Path. Exot.* 1916. Apr. Vol. 9. No. 4. pp. 215–219.

American leishmaniasis is clinically classified as follows :—

I. Skin .. (*a*) Ulcerating.
(*b*) Non-ulcerating or papulo-tuberculous.
(*c*) Atrophic.
(*d*) Lymphangitic.
(*e*) Circinate.

II. Mucous Membrane (*a*) Continuous with skin lesion (resembling Oriental sore).
(*b*) Not continuous with skin lesion (resembling Blastomycosis).

These clinical varieties are described in detail and only an outline of the descriptions can be given here :—

I. (*a*) This is defined as the ordinary variety described by all writers.

(*b*) The condition begins as a small wart which slowly increases in size without ulceration and persists for some time. The skin over it may be thickened or wrinkled. There may be several such warts becoming confluent and giving rise to a papillomatous appearance.

(*c*) Occurring especially at the level of the waist and on the thighs and buttocks. Characterised by numerous plaques of a deep red colour, round or oval in shape, surface depressed with a well defined margin. They may or may not ulcerate.

(*d*) Occurs especially on the legs, in the form of numerous ulcers situated along the course of the lymphatics, the earliest one being near the ankle.

(*e*) Occurs generally as a single large ulcer with an irregular margin. The author remarks that it is especially in this variety of ulceration that flagellate forms of leishmania are found.

II. (*a*) The leishmaniasis of the mucous membranes nearly always begins in the skin. The initial lesion in this variety is on the nose or lips and gradually reaches the mucosa. It does not produce the degree of tissue destruction of the following variety.

(*b*) The primary skin lesion is at a distance: on the fore-arm, the leg or the neck, and it is usually some considerable time later that the lesions of the mucosa make their appearance. These commence in the nasal mucous membrane and may progress for many years attacking the palate, pharynx, etc., without, however, necessarily endangering life. The condition may readily be confused with blastomycosis but leishmaniasis is distinguished by the result of microscopic examination and by the fact that it does not spread under the epithelium, whereas the yellowish spots of blastomycosis can be seen under the buccal mucous membrane.

E. J. W.

RABELLO (Ed.). **La Leishmaniose tégumentaire au Brésil.**—*Bull. Soc. Française de Dermat. et de Syph.* 1914–15. July–Dec. Vol. 25. No. 7. pp. 375–379.

This is a short paper based on the author's experience of the disease in Rio, and is for the most part a recapitulation of the existing knowledge of the subject. The following are points of interest:—

1. A rather common form of the disease is one in which an ulcer of the skin becomes the site of papillomatous plaques, hard and horny.
2. When the naso-oro-pharyngeal mucosa becomes affected, the trouble begins on the nasal mucous membrane of the right side as a small, raised, granular ulcer which may pass unnoticed for some time.
3. Navvies and railway workmen are especially subject to the disease.
4. From an etiological point of view, age and sex appear to have influence.
5. The Wassermann test may be positive in cases where syphilis can be excluded.
6. As regards treatment, applications of tincture of iodine, permanganate of potash, or argyrol are recommended for the skin lesions. Salvarsan in some cases improved the skin condition, but had no effect on lesions of the mucosa.

The author bears out the testimony of other workers as to the beneficial effect of intravenous injections of tartar emetic. The treatment is more quickly effective on lesions of the skin than on those of the mucosa and where the latter exist may have to be persisted with for several months.

E. J. W.

TORRES (Octavio). **Observação de um caso de leishmaniose cutanea.** [Notes of a Case of Cutaneous Leishmaniasis.]—*Brazil Med.* 1916. Feb. 19. Vol. 30. No. 8. pp. 57–60. With 4 figs.

Notes of a case of cutaneous leishmaniasis, successfully treated with tartar emetic, in a Syrian immigrant. Sixteen injections of tartar emetic, gradually increased from 4 to 10 centigrammes per dose

sufficed to bring about a cure. The illustration show the distribution of the ulcers over the patient's body. The history of the case was difficult to obtain, on account of the patient's inability to speak Portuguese freely.

J. B. N.

BORJA (Antonio) & AMARAL (Afranio). **Contribução ao tratamento da Leishmaniose cutaneo-mucosa pelas injecções endo-phlebicas de emetico.** [A Contribution to the Treatment of Muco-Cutaneous Leishmaniasis by Intravenous Injections of Tartar Emetic.]—*Arch. Brasileiros de Med.* 1915. Feb.–Mar. Vol. 5. No. 2–3. pp. 145–154. With 3 plates.

Notes of seven cases of leishmaniasis of the face treated on VIANNA's plan with injections of tartar emetic, with the exception that a 4 per cent. strength in physiological salt solution was employed instead of the one per cent. recommended by VIANNA. The dose of tartar emetic remains the same, but the reduction in the bulk of menstruum is found to obviate rises of temperature. Comparative tables of temperature are given to demonstrate this point.

J. B. N.

PROTOZOOLOGY.

BALFOUR (Andrew). **On the Occurrence of Herpetomonads (?) in Gerbils.**—*Parasitology.* 1916. Jan. Vol. 8. No. 3. pp. 260–261.

The author refers to the paper by FANTHAM and PORTER [see this Bulletin, Vol. 6, p. 183]. In 1904 or 1905 when working at trypanosomiasis in Khartoum, he observed a flagellate in the fresh peripheral blood of a gerbil (*Gerbillus pygargus*) which was clearly not a trypanosome, but unfortunately the preparation was destroyed. The movements of the flagellate "were exceedingly rapid and jerky," and the posterior end was curved or flexed a little so that it appeared hook-like. Although many more animals were examined, the parasite was not seen again till Capt. ARCHIBALD several years later observed a single example in the fresh blood of a gerbil, but the parasite could not be found when the preparation was fixed and stained. The author does not think that the parasite was due to accidental contamination. The flea most commonly found both on the gerbils and the jerboas in the Sudan is *Pulex cleopatrae*, in which the author found herpetomonads in 1906.

H. B. Fantham.

SANGIORGI (G.) & UGDULENA (G.). **Reperto di un flagellato (*Prowazekia italica*, n. sp.) nell' intestino umano.**—*Pathologica.* 1916. Apr. 15. Vol 8. No. 179. pp. 115–118.

The organism, *Prowazekia italica*, was found in a peptone-water culture of the faeces of a convalescent soldier in the chief military hospital in Venice. The flagellates could be subcultured on peptone water, on faeces, and on other media such as agar kept at a temperature of 22° C. to 24° C. Oval elements from peptone-water cultures usually measured 11·6μ by 8·3μ, but some were a little larger and others somewhat smaller. Teratological specimens of small breadth were sometimes seen. Vacuoles and food granules were present in some specimens. Two flagella occurred in each parasite and, as in Bodo, they arose anteriorly from two basal granules (diplosome). The kinetonucleus was large. Discoidal and pyriform organisms were also observed. A karyosome was seen very occasionally and with some difficulty in the kinetonucleus.

Multiplication was by longitudinal fission. Small daughter forms about 3μ in diameter have been seen. It is uncertain whether encystment occurs.

The organism is placed in the genus *Prowazekia*, and the specific name *italica* is assigned to it [but it is doubtful whether the organism is distinct from other species of Prowazekia described from cultures of human faeces.]

H. B. F.

ARAGÃO (Henrique de Beaurepaire). *Copromastix prowazeki*, **n. g., n. sp. (Nota prévia).**—*Brazil Med.* 1916. Feb. 12. Vol. 30. No. 7. p. 49. With 1 text-fig.

The author describes a flagellate found in cultures of human and frog faeces at Manguinhos, Brazil. The body of the organism is

roughly triangular, measuring 15μ long by 8μ broad. There is a nucleus near the anterior end and there is a cytostome at a corner near by. A rhizostyle is present, and four equal flagella arise from a basal corpuscle thereon. The flagellate executed slow and graceful movements, turning on its long axis.

The diagnosis of the new genus Copromastix is as follows:—A Tetramitid, with four anterior equal flagella, a subtriangular body, and a cytostome containing no organella. Neither undulating membrane nor axostyle is present.

The type species, *C. prowazeki*, is named after Dr. S. von PROWAZEK. There is one text-figure.

H. B. F.

KOFOID (Charles Atwood) & SWEZY (Olive). **Mitosis and Multiple Fission in Trichomonad Flagellates.**—*Proc. Amer. Acad. Arts & Sci.* 1915. Nov. Vol. 51. No. 6. pp. 289–378. With 8 plates and 7 text-figs.

This long and well illustrated memoir is fully summarised in the authors' own words, thus:—

"1. The upper part of the large intestine of most vertebrates is infected by trichomonad flagellates whose phases of mitosis and multiple fission occur at intervals and are met with in a few of the many hosts examined. These processes are carried out during periods of great amoeboid activity of these parasites in the mucus of the intestinal epithelium.

"2. Mitosis is promitotic with nuclear membrane intact throughout the period of division, with nuclear separation by constriction simulating amitosis. It is, however, essentially mitotic with extranuclear division centres, intranuclear spindle fibres, chromosome organization out of a chromatin network and skein.

"3. The chromosomes are definite in number, four in *Tetratrichomonas prowazeki*, and five in *Trichomonas augusta*, *T. muris*, and *Eutrichomastix serpentis*. They are differentiated in form, there being one small one, and some fairly constant size differences among the larger ones. They are differentiated in behaviour, the small one (in *T. muris*) having a particular location in the nucleus in the late prophase, and lagging on the spindle in the metaphase.

"4. The chromosomes appear to split longitudinally prior to their arrangement in the equatorial plate, and seem to slip into an end-to-end position in this plate, or to be parted by a transverse constriction.

"5. The extranuclear organelles all share in the process of mitosis. The blepharoplast from which flagella, rhizoplast, chromatic margin and basal rod, and axostyle all take their origin, contains the division centre. It parts into two bodies which go to the two poles of the fusiform mitotic nucleus spinning out the deeply staining always extranuclear paradesmose between them.

"6. The daughter blepharoplasts may each divide in the polar position into an axial centrosome and an adjacent basal granule to which flagella, paradesmose, and parabasal are attached. These two granules subsequently reunite.

"7. In its divisions the blepharoplast shows no independent mitotic phenomena. It is not a 'kinetonucleus,' and its behaviour does not support the binuclearity hypothesis.

"8. The anterior flagella are shared, two and one respectively by the daughter blepharoplasts, and new outgrowths complete the complement of each daughter organism.

"9. The chromatic margin of the undulating membrane represents an intracytoplasmic posteriorly directed flagellum. It splits longitudinally to the tip of its projecting end. The undulating membrane below it also splits.

"10. The chromatic basal rod is the homologue of the parabasal body of *Parajoenia* and the Trichonymphida as established by Janicki. His so-called parabasal in *Trichomonas* is in reality only the early stage in the outgrowth of a new parabasal or chromatic basal rod at mitosis, hence its rarity and transitory nature. At mitosis a new parabasal or chromatic basal rod grows out in the base of one of the new undulating membranes while the old parabasal lies in the other membrane.

"11. The new axostyles of the daughter organisms are formed by the longitudinal splitting of the old axostyle from the anterior end posteriorly. They are not formed from the paradesmose (central spindle) as maintained by Dobell nor anew as claimed by Kuczynski.

"12. The axostyle is not primarily a skeletal structure as usually supposed, nor an organ of fixation as described by Kunstler and Kuczynski but a locomotor organ used vigorously during the amoeboid stage in the mucous substrate.

"13. During mitosis the organelles are subject to a wide variation in location due to independent shifting of axostyle and nucleus, and to a less extent to the detachment of the blepharoplast from its usual relation to the nucleus.

"14. Plasmotomy is long delayed after nuclear mitosis and during this period many widely varying positions of the two daughter nuclei and their attached extranuclear organelles are rapidly assumed. Some of these may simulate copulation.

"15. The plane of division is longitudinal. Its determination should be based on the fundamental morphological relations of the organelle and not, as by Martin and Robertson, on the chance relations of these structures in the amoeboid postmitotic period.

"16. Multiple fission occurs in the trichomonad flagellates as a normal phase of the life-cycle and results in the formation of an 8-nucleate plasmodium or somatella. We have not been able, as yet, to relate it to a particular stage such as gametogenesis, or to the divisions of a zygote. Three rapidly succeeding synchronous mitoses give rise to 2–4–8–nucleate plasmodia which are not encysted and remain very active throughout the process. The plasmodium disintegrates into its component members by the successive detachment of single merozoites.

"17. The widespread and regular occurrence of the stage of a multinucleate plasmodium among these simple protozoa is significant as an early step in the evolution of the more permanent multinucleate and multicellular aggregates which constitute the Metazoa."

H. B. F.

Kofoid (Charles Atwood) & Christiansen (Elizabeth B.). **On the Life-History of Giardia.**—*Proc. Nat. Acad. Sci.* 1915. Nov. Vol. 1. No. 11. pp. 547–552. With 1 text-fig.

During the authors' investigations at Berkeley, California, 220 mammals were examined, consisting of various rats, mice and coyotes. About 13 per cent. of the animals were infected with species of Giardia, especia ly *G. muris* and *G. microti* sp. nov. These flagellates, commonly known as Lamblia, produce a chronic enteritis in young mice.

The authors' results, which are apparently preliminary, are best summarised in their own words, as given in their last paragraph :—

"Our work has shown that *Giardia muris* and *G. microti* produce a readily recognizable enteritis in mice, and that both binary and multiple fission take place in the free non-encysted stage. It may be found abundantly in material well smeared out from the intestinal epithelium. Multiple fission results in a 16–nucleate, 8–zooid plasmodium which later undergoes disintegrative plasmotomy. There is no *Octomitus* stage in the life-history of *Giardia*. There is typically one axostyle in the trophozoite. Prophase stages in which this has divided to form two axostyles are often seen. The so-called 'Rätzelkörper' are homologues of the parabasals of the trichomonads. The extranuclear organelles are united with the

karyosome, centrosome, and blepharoplast in an integrated neuromotor apparatus. Mitosis is intranuclear, with precocious splitting of the four chromosomes which subsequently fuse in four in the equatorial plate. Free pairs of individuals are found united in back-to-back position as in the so-called conjugation cysts. Nuclei in these cysts undergo two divisions simulating reduction divisions in which, however, chromosomes reduction has not been demonstrated. No evidence in support of autogamy and no proof of sexual reproduction has been discovered.

"Morphological characters separate six species in *Giardia*. The parasite in mice appears to be distinct from that in man. The generic name *Giardia* Kunstler should supersede *Lamblia* Blanchard on grounds of priority."

H. B. F.

SANGIORGI (Guiseppe). **Di un coccidio parassita del rene della cavia.** —*Pathologica.* 1916. Feb. 15. Vol. 8. No. 175. pp. 49–53.

The author has found in the kidneys of experimental guinea-pigs a coccidian parasite which he considers specific to the host. The parasites were found in the renal epithelium, both intracellular and free, the cells of the convoluted tubules containing intracellular forms, while extracellular parasites were found in the loop of Henle and the straight tubules. Rounded forms, which were mostly intracellular, varied in diameter from 6·4μ to 19·2μ. Oval and irregularly rounded forms were also intracellular and were variable in size, such as 8μ by 4·8μ up to 19·2μ by 16·6μ. Extracellular forms were of two types, usually oval, and measured 12·8μ by 8μ and 16μ by 9·6μ respectively. Vacuolation occurred in intracellular forms. Young schizonts were small, spherical and about 6·4μ in diameter. They increased in size and 18 to 24 merozoites were formed within them. These daughter forms were small, averaging 4·8μ by 1·6μ. Probable gametocytes of both sexes were also observed, and the author thinks that the microgametocytes give rise to four oval microgametes. A parasite which he believed to have been a macrogamete measured 19μ in diameter. Zygotes measured 12·8μ by 8μ and were encapsuled. Many spherical sporozoites, of a diameter of about 3·6μ, were formed within the zygote.

Schizogony occurred in the epithelium of the convoluted tubules, and sporogony in the lumen of the straight tubules and loop of Henle.

It was shown experimentally that the urine of an infected guinea-pig, which contained cysts of the coccidian parasite, when mixed with food and ingested by a healthy guinea-pig, reproduced renal infection in the new host.

The author briefly considers the systematic position of the parasite which he places in the genus *Klossia* and, considering it specific to the guinea-pig, calls it *Klossia caviae.*

[SEIDELIN (Dec. 1914) has previously described this parasite under the more correct generic name, *Klossiella*, and suggested the specific name, *K. cobayae.* (See this *Bulletin*, Vol. 5, p. 284).]

H. B. F.

PETTIT (Auguste). **Sur un Sporozoaire parasite du Cobaye, appartenant au genre *Klossiella* Smith et Johnson.**—*C. R. Soc. Biol.* 1916. Feb. 19. Vol. 79. No. 4. pp. 168–170.

The author has observed a Klossiella in one kidney of a guinea-pig bred in the Institut Pasteur at Garches. The infection was rare and

the full life-cycle of the parasite could not be observed. At first the organism is rounded and small, about 7μ in diameter. The cytoplasm of the host cell hypertrophies and finally forms a sheath to the sporozoön. Mitoses occur at the periphery of the parasite and growth continues until the organism is about 30μ in diameter. A number of ovoid corpuscles about 10μ are ultimately produced, each consisting of a thin refringent cuticle surrounding a granular cytoplasm containing nuclei in karyokinesis. These various forms only were observed. The organism is identified with *Klossiella cobayae* Seidelin 1914 [see this *Bulletin*, Vol. 5, p. 284]. The parasite, however, was first observed by PIANESE and described by him in 1901 in an important memoir which has been largely overlooked.

H. B. F.

PEARCE (Louise). **Klossiella Infection of the Guinea-pig.**—*Jl. Experim. Med.* 1916. Apr. Vol 23. No. 4. pp. 431–442. With 8 plates.

The material consisted of sections of the kidneys of 60 adult guinea-pigs from Philadelphia and New Brunswick, N.J. Twelve guinea-pigs were found to be infected with a renal parasite which closely resembled *Klossiella muris*. Mention is made of the previous work of SMITH and JOHNSON and of SEIDELIN [see this *Bulletin*, Vol. 5, p. 284].

The sporoblast cycle is stated to be most frequently a small round or ovoid body measuring 7μ to 8μ in diameter, and occurring in the lumen of the kidney tubules, usually in the straight tubules of the inner half of the cortex, sometimes in the convoluted tubules. The sporoblast divides into eight to twelve small falciform bodies, 1μ by 4 to 5μ, which are the sporozoites.

Ring forms, 18μ to 20μ in diameter, occur within epithelial cells, which become enlarged. This annular form contains 12 to 18 segments arranged in a circle, each measuring 3μ by 5μ to 7μ. Small ovoid hyaline forms, 5μ to 8μ long by 3μ to 5μ broad, were also seen, and may be either extra- or intra-cellular.

Spherical schizonts, 22μ in diameter, contain 30 to 40 tiny fusiform merozoites, which are extracellular, occurring in the lumen of the convoluted tubules. The merozoites are similar to the sporozoites, but are not common.

The parasite produces lesions. These "consist in an irregular accumulation of fibroblasts and small round cells about the base of some of the glomeruli."

The relationship of the various stages of the parasite found is discussed. A possible ring-shaped microgametocyte was seen.

The plates contain 21 figures, mostly microphotographs.

The author's summary is :—

"We have found in the kidneys of twelve supposedly normal guinea-pigs, coming from Pennsylvania and New Jersey, a parasite that closely resembles in some of its phases *Klossiella muris*, described by Smith and Johnson, and the renal parasite of two West African guinea-pigs, described by Seidelin.

"The forms most commonly found by us and described as the sporoblast cycle, are evidently similar to those described by Smith and Johnson and by Seidelin. There are certain discrepancies of measurement between the parasite described by Seidelin and the one here described, but the most important difference between the two is the different number of sporozoites resulting from a final division of the daughter sporoblasts. Seidelin has

found thirty sporozoites ; we have found from eight to twelve, while the usual number is eight. Further, we have found a ring form which is unlike any of the stages in either the sporoblast or schizogonic cycle, and which we interpret tentatively as the male element or microgamete. In addition, we have found a tubular form which resembles the glomerular body of *Klossiella muris* and which we think is the schizogonic phase of this parasite."

H. B. F.

CRAWLEY (Howard). **Note on the Stage of *Piroplasma bigeminum* which occurs in the Cattle Tick *Margaropus annulatus*.**—*Jl. Parasit.* 1915. Dec. Vol. 2. No. 2. pp. 87–92. With 4 figs.

The stage of *Piroplasma bigeminum* found is gregarinoid and was observed in engorged female ticks removed from cattle in Bethesda, Md., in September 1913. The gregarinoids—which are indicated in four text-figures—correspond to the club-shaped bodies described by CHRISTOPHERS (1907) in dog ticks transmitting *P. canis*. References to the literature on this subject and to cultural forms are given. The author's summary, which clearly indicates his results, is as follows :—

"A parasitic protozoan was found in smears made from female cattle ticks (*Margaropus annulatus*), and from crushed eggs which they had deposited. The parasite has the form of a minute polycystid gregarine, and is believed to represent the stage of *Piroplasma bigeminum* occurring in the tick. It is essentially like the form figured and described by Koch as present in engorged female ticks and their eggs, and also like the form of *Piroplasma canis* found by Christophers in *Rhipicephalus sanguineus*. In the present case, it is of interest to note that the female ticks in which the parasites were found showed an unusual mortality, suggesting that the parasite is pathogenic for the tick as well as for the cow. In addition to the gregarinoid parasite a spirochaete was found in the ticks. This parasite not heretofore reported from the United States is perhaps the same as the form known as *Spirochaeta theileri*."

H. B. F.

YAKIMOFF (W. L.). **A propos de la note de M. Rodhain sur *Theileria ovis*.**—*Bull. Soc. Path. Exot.* 1916. Apr. Vol. 9. No. 4. p. 201.

The author points out that, prior to the discovery by RODHAIN in 1916 of an endocorpuscular parasite considered identical with *Theileria mutans* in the blood of Ovidae [see below, page 25], he had described the same organism in 1913, and had named it *Theileria ovis*. *Piroplasma ovis* and *Theileria ovis* were found in April and May, 1913, in Ovidae in Russian Turkestan.

H. B. F.

SCHUBERG (A.) & RODRIGUEZ (Carlos). *Thelohania corethrae*, **n. sp., eine neue Mikrosporidienart aus Corethra Larven.**—*Arb. a. d. Kaiserl. Gesundh.* 1915. Sept. Vol. 50. No. 1. pp. 122–132. With 2 plates.

The authors have examined larvae of *Corethra* (*Savomyia*) *plumicornis*, found in the pools and experimental ponds in the grounds of the Imperial Institute at Dahlem. Towards the end of 1911 transparent larvae with spherical inclusions were seen. These inclusions proved to be masses of Microsporidia, and provided the material on which the present results are based. Gilson's fluid was used as a fixative and smears and sections were examined. The parasites were most abundant

in the thorax, under the air-sacs and in the sixth to eighth segments of the larvae. They also occurred in the head above the facetted eyes. They were not present in the musculature or fat body. The intracellular forms of the parasite were contained in oenocytes, the youngest stages being small spheres usually with two nuclei. They grow into longish oval forms with a nucleus at each pole. Each organism undergoes nuclear division until eight nuclei are produced. The protoplasm segregates into eight bodies, each nucleus divides into two and a rosette of eight binucleate daughter forms is produced. Multiplication is accompanied by growth, each of the eight daughter forms becoming as large as the parent. Sporogony ensues, the spores being produced from an eight-nucleate parent form. Each spore is uninucleate and has a girdle-like mass of sporoplasm and a polar filament, while some chromidial granules may be present.

The parasite is placed in the Oligosporogenea, a sub-division of the Microsporidia. It is considered to be a new species of the genus Thelohania and is named *Thelohania corethrae.* H. B. F.

GALLI-VALERIO (B.). **Are Sarcosporidia Aberrant Forms of Cnidosporidia of Invertebrates?**—*Jl. Parasit.* 1916. Mar. Vol. 2. No. 3. pp. 126–128.

The author states that in 1896 PIANA obtained motile amoebic bodies from cultures of *Sarcocystis tenella*, and that he, himself, in 1913 obtained similar bodies from cultures of *S. muris.* ERDMANN (1914) found amoebulae in the intestinal cells of mice experimentally infected with Sarcosporidia by the mouth [see this *Bulletin*, Vol. 4, p. 391].

Reference is also made to infections with Myxosporidia and to DARLING's suggestion that Sarcosporidia may be "side-tracked varieties of some of the Neosporidia of invertebrates" [see this *Bulletin*, Vol. 6, p. 201].

The author's summary is :—

"1. The observations of Piana and Galli-Valerio to the effect that spores of Sarcosporidia produce amoebic bodies in cultures, more closely relate the Sarcosporidia to the Cnidosporidia.

"2. If true that Sarcosporidia are only aberrant forms of Neosporidia of invertebrates, then the hypothesis of Darling becomes more probable."

H. B. F.

WATSON (Minnie E.). **A New Infusorian Parasite in Sand Fleas.**—*Jl. Parasit.* 1916. Mar. Vol. 2. No. 3. pp. 145–146. With 5 text-figs.

Two sand fleas out of 300 examined at Long Island Sound, N.Y., were found to be infected with a new species of Balantidium. The sand fleas were *Orchestia agilis* and *Talorchestia longicornis* ; they were infected in their alimentary tracts.

The trophic forms of the Balantidia, which were numerous, measured 300μ to 360μ by 180μ to 220μ. The body was ovoidal or ellipsoidal, the macronucleus ellipsoidal, and the micronucleus was small and contiguous to the larger nucleus. There was a small and inconspicuous apical or subapical oval groove, leading into a short slender oesophagus, also a contractile vacuole at the opposite end. Transverse fission was observed and conjugation was seen in one instance.

The parasite is named *Balantidium orchestium.* H. B. F.

PORTER (Annie). **The Occurrence of *Pneumocystis carinii* in Mice in England.**—*Parasitology.* 1916. Vol. 8. No. 3. pp. 255–259. With 8 text-figs.

The author summarises the history of small pulmonary cysts in mammals and mentions their confusion with stages of the life-cycle of certain trypanosomes. Pneumocysts have been found in rabbits, dogs, cats, lambs, goats, rats, and possibly man. The parasite is now described from a healthy wild mouse accidentally killed in Cambridge. The lung cysts were spherical or oval bodies 4μ to 5μ in diameter when young, and 5μ to $6{\cdot}5\mu$ when mature. At first they were uninucleate, but older cysts showed two, four or eight nuclei. Eight vermicular merozoites were produced, each with a single nucleus, and measuring $1{\cdot}5\mu$ to $2{\cdot}5\mu$ by $0{\cdot}5\mu$. These stages are illustrated by text figures. The probable mode of transmission is contaminative, such as by means of the oral or nasal secretions. The mouse was not parasitised by trypanosomes, leucocytogregarines or coccidia.

The author's conclusions are :—

"*Pneumocystis carinii* has been found in the lungs of a mouse in England. The cysts are spherical or oval and are 4μ to $6{\cdot}5\mu$ in diameter; eight merozoites are finally formed within them. The organism appears to be an independent parasite of the lungs of certain vertebrates, and to be unconnected with any trypanosome."

H. B. F.

SMITH (Theobald). **Aberrant Intestinal Protozoan Parasites in the Turkey.**—*Jl. Experim. Med.* 1916. Mar. Vol. 23. No. 3. pp. 293–300. With 1 plate.

The parasite was found in a single turkey, which was raised with eighteen others in an incubator and brooder. When about two months old, it appeared quiet and sleepy and refused food. It was killed for examination. The autopsy showed no lesions of "blackhead"; there was a distinct increase in mucus in the caeca, and several coccidian oocysts were passed in the faeces when the bird was dying. The duodenal contents were markedly yellow in colour. Examination of fixed and stained intestinal tissue "showed the presence of peculiar bodies in the subepithelial tissues of the villi of the small intestine, which were tentatively diagnosed as the asexual or schizogonic cycle of some coccidium." The author considered the habitat of the parasitic bodies to be apparently unusual, as they were more numerous "in the adenoid tissue of the mucosa" than in the epithelial layer, where they appeared to him to be intercellular. He also considers that the parasite of blackhead "is a purely connective parasite and does not enter epithelial cells at any time."

In sections of the caeca of the turkey two small areas occurred within which "nearly every epithelial cell contained minute protozoa which on further study were diagnosed as true coccidia." These parasites were young forms, and the author "is inclined to regard these epithelial cell parasites as belonging to a species distinct from that in the subepithelial tissue, and perhaps the same as the species represented by the oocysts found in the contents of the large intestine at autopsy."

The author discusses the frequency of the occurrence of stages of coccidia in the subepithelial regions of the intestine, but reaches no decision on the subject. Whether the parasite of blackhead be a coccidium or not, the author acknowledges that in the raising of turkeys losses due to avian coccidiosis will occur. The paper is illustrated by four somewhat indistinct photomicrographs [which—as far as it is possible to judge—show trophic and schizogonic stages of *Eimeria avium*].

H. B. F.

CHATTON (Edouard) & BLANC (Georges). **Précisions sur la morphologie de l'hématozoaire endoglobulaire de la Tarente : *Pirhemotocyton tarentolae* Chatton et Blanc.**—*C. R. Soc. Biol.* 1916. Jan. 22. Vol. 79. No. 2. pp. 39–43. With 1 fig.

The authors have re-examined their material containing the endoglobular parasite of the gecko named by them in 1914, *Pirhemocyton tarentolae* [see this *Bulletin*, Vol. 5, p. 290.] The principal forms of the parasite are stated to be (*a*) spherical with diffuse chromatin (1μ to 4μ); (*b*) amoeboid with massive chromatin (2μ to 4μ); (*c*) spherical with granular peripheral chromatin (3μ to 5μ). There are also pyriform parasites and a few leishmaniform types considered by the authors to be of no particular significance. No multiplicative and no extra-globular stages have been observed. A refringent globoid body, independent of the parasite but nearly always accompanying it, also occurs in the host erythrocytes. The systematic position of the parasite is doubtful.

H. B. F.

CARINI (A.) & MACIEL (J.). **Quelques hémoparasites du Brésil.**—*Bull. Soc. Path. Exot.* 1916. Apr. Vol. 9. No. 4. pp. 247–265.

The present paper deals with the haemoparasites of birds of Brazil, the greater part of the work having been done on dry smears of the blood of birds that had been shot, so that practically no observations of the living organisms were possible.

The first section of the memoir is occupied with descriptions of 18 microfilaria, mostly observed in different hosts. A section on the Protozoa follows.

Five trypanosomes are briefly described, their dimensions being given in a table. Thus, the trypanosome from *Tyrannus melancholicus* has a total length of 27·5μ and a maximum breadth of 4·5μ. The free flagellum is 9μ long and is delicate. Two forms of trypanosome from *Chamaesa brevicauda* are described, a long thin form and a shorter broader one. The organisms measured 22μ to 26μ in total length, are 2·5μ to 4·5μ broad and possess an almost indistinguishable undulating membrane. The trypanosome from *Aaptus chopi* has a breadth of 8·5μ, its length is uncertain and it is very rare, the description being based on a single specimen. The trypanosome from *Cacicus chrysopterus* is remarkable in that at the base of the undulating membrane there is a band giving the impression of a second flagellum, which is perhaps comparable with the supporting structure of the undulating membrane of Trichomonas. This trypanosome has a total length of 31μ and a breadth of 5μ. The trypanosome of *Turdus*

rufiventris exhibits broad and narrow forms, is sinuous and has a very delicate flagellum. A list of Brazilian birds known to harbour trypanosomes is given.

Halteridium (or Haemoproteus), which is very common in Brazilian birds, has been found by the authors in ten different avian hosts. A table is given showing the form of the parasite, the character of the pigment produced and the alteration in the host cell. Three new avian hosts of Plasmodium (or Proteosoma) have been found. The parasites were of the usual type. Some deformation of the host cells occurred, and in *Colaptes campestris* and *Rhea americana* there was decoloration of the erythrocytes, but in *Synallaxis ruficapilla* there was no such decoloration.

Six new avian hosts of Toxoplasma (or Haemogregarines ?) are recorded. In morphology and biology the organisms resemble those described by other authors. The parasites multiply in the epithelial cells of the intestine, in the liver and especially in the lungs. The invaded host cells do not seem to be markedly affected by the presence of the toxoplasms, which seem to be non-pathogenic. Transmission experiments, using pigeons and other birds, have so far been unsuccessful, as have also attempts at culture. Infection with *Toxoplasma avium* is believed to be fairly common among Brazilian birds. H. B. F.

RODHAIN (J.). **Note sur les Trypanoses et les Piroplasmoses des grands animaux de l'Ouellé.**—*Bull. Soc. Path. Exot.* 1916. Feb. Vol. 9. No. 2. pp. 95–109. With 1 fig.

An examination was made of the parasites found in the larger domestic and wild mammals occurring in the north-east of the Congo basin. The trypanosomes were of the types *T. vivax* (*cazalboui*), *T. congolense* and of the large *T. ingens*. The last named was found in *Cephalophus dorsalis*. A table is given showing the distribution of these flagellates among the animals examined.

Six *Glossina fusca*, out of 26, were found to be parasitised with flagellates. In four of these flies multiplication of the flagellates was limited to the proboscis, in the remaining two the parasites were multiplying in the intestine and had advanced as far as the proboscis tube. The salivary glands were not infected. Complete development of the trypanosome occurred in the tsetse proboscis in one case only. The flies were caught in the forest, on the bodies of dead elephants or buffaloes.

Among the Piroplasmidae found were *Piroplasma bigeminum*, *Theileria mutans*, *Theileria ovis*, n. sp., and *Piroplasma canis*.

Theileria ovis is characterised by the rarity of bacillary forms, nearly all those seen being rounded or ovoid. Cross-forms were observed, and multiplication was seen in heavily infected blood. No developmental forms analogous to those of *Theileria parva* were found in the organs of infected sheep at autopsy. The degree of pathogenicity appears to be slight and trypanblue seems to have but a feeble action on the parasite. This organism appears to be quite distinct from European ovine piroplasmata.

A list is given of the principal blood-sucking Diptera attacking mammals in Ouellé. They belong to the Stomoxydinae, Pangoninae and Tabaninae. H. B. F.

KOLMER (John A.) & SMITH (Allen J.). **The Bactericidal and Protozoacidal Activity of Emetin Hydrochlorid** *in vitro.*—*Jl. Infect. Dis.* 1916. Mar. Vol. 18. No. 3. pp. 247–265.

The bactericidal action of emetin hydrochloride was studied *in vitro*, in fluid and solid culture media, on *Staphylococcus aureus*, *Streptococcus salivarius*, *B. typhosus*, *B. anthracis*, and *B. subtilis*. The protozoacidal action was studied on *Trypanosoma lewisi*, *T. equiperdum* and *Endamoeba gingivalis*.

Dilutions of pure phenol were used as control germicide in the case of bacteria, and normal salt solution was used in control preparations of Protozoa.

When *Endamoeba gingivalis* was attacked by emetine it assumed a hyaline and relatively opaque appearance, the clear ectoplasm first manifesting the change. Fresh amoeba-bearing pus from pyorrheal pockets mixed with equal parts of weak solutions of emetine in normal saline of varying strengths was observed. It was found that after the action of emetine of strength 1 in 409,600 the amoebae were motile, hyaline and showed pseudopodia after two hours, but at four hours and six hours became motionless, hyaline and rounded. The authors, however, " are unwilling to say at what time and at what dosage death of the amoebae takes place."

The influence of emetine on spirochaetes in thick emulsions of pyorrheal pus was also studied. On the basis of motility alone, dilutions of emetine from 1 in 400 to 1 in 12,000 seemed to exert spirochaeticidal action.

The trypanocidal effect of emetine was tested in subinoculated white rats. The blood was diluted with warm saline-citrate solution so as to show at least 10 trypanosomes in a field of the microscope ($\frac{1}{6}$ inch objective and No. 4 eyepiece of Leitz). Various dilutions of emetine were mixed with equal quantities of trypanosome emulsions. It was found that " a dilution of emetine of 1 : 25,000 was destructive for *T. lewisi* and a dilution of 1 : 6000 for *T. equiperdum*."

The authors' conclusions are :—

" Emetin hydrochlorid possesses bactericidal properties, but prolonged contact with bacteria is required before this action becomes apparent. A 5 per cent. solution of emetin failed to kill *B. typhosus* in 15 minutes, but with a special technic, in which the drug remains in contact with the test microorganisms, emetin proved about equal to, or even on occasion five times more antiseptic and germicidal than corresponding dilutions of pure phenol.

" The bactericidal activity of emetin is more apparent in fluid than it is in solid culture media.

" In an emulsion of pus and various bacteria from pyorrhea alveolaris a 2 per cent. solution of emetin required 45 minutes to effect sterilization, whereas a corresponding dilution of phenol proved germicidal in five minutes or less ; a 0·5 per cent. solution of emetin required 1½ hours, and a corresponding dilution of phenol, 45 minutes, to sterilize the emulsion.

" Emetin hydrochlorid possesses trypanocidal properties *in vitro*, but this action is probably less vigorous than is its amebacidal action.

" Emetin is highly amebacidal, producing a marked structural change in *Endameba gingivalis* when applied in direct contact, even in high dilution.

"Emetin hydrochlorid probably exerts some bactericidal action when applied locally in the treatment of pyorrhea alveolaris; but its bactericidal activity must be entirely secondary in importance to its amebacidal action, in view especially of the beneficial results and the disappearance of amebae following the hypodermatic use of the drug in the treatment of pyorrhea alveolaris and amebic dysentery when the drug is highly diluted in the body fluids.

"In view, however, of the probable bactericidal value of emetin when applied locally it would appear that the logical treatment of pyorrhea alveolaris should consist primarily in its local application combined with hypodermatic administration, especially in severe infections or in those accompanied by systemic complications."

H. B. F.

KOLMER (John A.) & SMITH (Allen J.). **The Bactericidal and Protozoacidal Activity of Emetin Hydrochlorid** *in vivo.*—*Jl. Infect. Dis.* 1916. Mar. Vol. 18. No. 3. pp. 266–276.

In the part of the paper relating to experiments on the Protozoa the authors state that "the amebacidal action of emetin was of minor importance in this investigation by reason of the large amount of work that had been done in this direction." The authors experimented hypodermically with *Endamoeba gingivalis.* It has been found that 0·016 to 0·065 gm. (i.e., 1/4 to 1 grain) of emetine is sufficient to exert amebacidal action.

The action of emetine on trypanosomes, *T. equiperdum* and *T. lewisi* in white rats, was also investigated. Such action is slight.

The authors' conclusions are :—

"Emetin hydrochlorid administered intravenously to rabbits in doses varying from 0·065 to 0·52 gm. (one to eight grains) per 132 pounds of body-weight exerted slight or no antiseptic or germicidal influence on a virulent culture of *Staphylococcus aureus*; abscesses developed in the internal organs of the majority of experimental animals.

"Emetin hydrochlorid administered intraperitoneally to mice in doses varying from 0·065 to 0·25 gm. and 0·975 gm. (1 to 8 and 15 grains) per 132 pounds of body-weight exerted no appreciable inhibitory or germicidal action on anthrax and tetanus bacilli.

"Emetin hydrochlorid administered intravenously to white rats, infected 24 hours previously by intraperitoneal injection with *T. equiperdum* and *T. lewisi*, in doses varying from 0·065 to 0·78 gm. (1 to 12 grains) per 132 pounds of body-weight, appeared to exert a slight trypanocidal influence, which was most apparent in the experiments with *T. equiperdum.*

"Emetin hydrochlorid is highly and specifically amebacidal *in vivo*, and its curative effects in amebic infections is to be attributed practically solely to this action. While the drug has slight bactericidal powers *in vitro* under the conditions of prolonged contact with micro-organisms, and while this germicidal action may enhance the value of emetin in the treatment of amebic infections by local application, in the light of our experiments this bactericidal action is not in evidence *in vivo.*

"These observations constitute additional evidence of the active rôle played by *Endamoeba gingivalis*, Gros., in the pathogenesis of pyorrhea alveolaris; improvement or cure of this disease with emetin by subcutaneous injection is to be attributed solely to its amebacidal action. In the treatment with local applications of the drug the beneficial results are to be ascribed in most part to this same influence, although here there is reason to believe that the beneficial effects are, to some degree at least, due to a coincident bactericidal influence on the part of the drug."

CHATTON (Edouard) & BLANC (Georges). i. *Cryptoplasma rhipicephali*, **n. g., n. sp., protiste endoparasite de la tique,** *Rhipicephalus sanguineus* **du Gondi:** *Ctenodactylus gundi.*—*C. R. Soc. Biol.* 1916. Feb. 5. Vol. 79. No. 3. pp. 134–138. With 2 text-figs.

ii. **Un Pseudo-parasite** *Cryptoplasma rhipicephali* **Chatton et Blanc.**—*Ibid.* May 20. No. 10. p. 402.

i. The authors have found a new parasite in the tick *Rhipicephalus sanguineus.* The work was done in Tunis in 1914 and the ticks were found on the gondi. The new protistan parasite was found only in stained preparations made from nymphs of the ticks. It has not been seen *in vivo*, and its exact location in the tick nymph is uncertain. The parasites seen were all at one stage of development. They are slightly arcuate bodies, measuring 55μ to 56μ long by 5μ broad, and are flexible. Each organism contains cytoplasm and is surrounded externally by a cyst wall, outside which is a curious helicoidal chromatic tract, which may possibly represent the nuclear remains of a host cell. The name given to this organism is stated to be provisional.

ii. In this note the authors state that the structures previously described by them as *Cryptoplasma rhipicephali* were really the spermatozoa of the tick, *Rhipicephalus sanguineus.*

H. B. F.

MALARIA.

WESSELHOEFT (Conrad). i. **The Early History of Malaria.**—*New Orleans Med. & Surg. Jl.* 1916. May. Vol. 68. No. 11. pp. 693–701.

ii. **The Discovery of the Cinchona Bark.**—*Ibid.* pp. 702–714.

iii. **The Introduction and Early Use of Cinchona Bark.**—*Ibid.* pp. 715–727.

These three instructive and very ably written essays being almost exclusively of historic and literary interest defy all attempts at condensation. They are a treat to read, and the references appended to each are valuable.

i. The first, dealing with the early history of periodic fever, starts with the conjectures which have sought to explain the fables of the Lernean Hydra overcome by Hercules, and the mud-begotten Python slain by Apollo, as misty traditions of the subjugation of malaria. The author thinks them fanciful, and indeed they are much on a level with the ratiocination of those sages who discern in Mistress Quickly's remark "Hang hog is bacon," and Pistol's exclamation "Pauca, there's enough," the culminating proof that the author of these famous characters was Lord Bacon. HIPPOCRATES and his conclusive nomenclature of intermittent fevers are touched in, and the speculations of W. H. S. JONES, the annals of CELLI, and the observations and surmises of numerous ancient and mediaeval writers are noticed, down to SPIGELIUS who brings the prae-cinchona period to a close. Among the miscellanea mention is made of the Hindu legends of terrible mosquitoes whose bite, as painful as the serpent's, causes fever, shivering, and other dolours. The essay concludes with an historical sketch of the treatment of fevers, from HIPPOCRATES to SPIGELIUS.

ii. Coming to the cinchona period the author in his second essay tackles the question of the original discovery of the medicinal value of cinchona-bark, and in the true scientific spirit eschews the *a priori* method and sticks to historical fact. He reviews in chronological order the relevant statements of the explorers and naturalists (including such celebrated names as JUSSIEU, von HUMBOLDT, TSCHUDI, Clements MARKHAM) who have recorded their travels in South America, and notices that all of them except von HUMBOLDT and (with certain geographical limitations) Clements MARKHAM, agree that the Indians were quite familiar with the properties of the bark and commonly used it as a febrifuge. HUMBOLDT alone states that he never saw the bark used by natives except those employed by Spaniards as bark-peelers; that for the cure of ague the unsophisticated Indians used lemon, coffee, and the fruits and infusions of other plants; and that it was the Jesuits who, being accustomed to distinguish trees by chewing the bark, first noticed the bitterness of cinchona and then experimented with it therapeutically. The statements of Clements MARKHAM are ambiguous: since the bark is not mentioned either by the Inca Garcilasso or by Acosta in their lists of Indian medicines, and is not found in the wallets of itinerant native doctors who are soaked in centuries of tradition, he is convinced that it was not known to the Incas, though he states that it was known as quina-quina and used as a febrifuge in the province of Loxa.

The author mentions the story of the Countess of Chinchon, a vicereine, who herself was cured by bark and afterwards introduced it into Europe, but he also notices that history is uncertain whether the Countess of Chinchon—if indeed she were the undisputed personage of the story—ever returned to Spain. He evidently has his doubts, though he is far from placing the story in the same category with the legend of the ague-stricken lion that was seen chewing the bark, or the legend of the fever-distracted Indian who promptly recovered after perforce drinking water from a pool into which some cinchona-trees had fallen, which are the indigenous originals of the discovery of the medicinal value of cinchona.

After reviewing all the evidence the author accepts the belief that the Indians were the original discoverers, and that the Spanish conquerors adopted the use of the bark from them. As to HUMBOLDT's theory, the author pertinently remarks that if the Jesuits had made the discovery that powerful and dexterous Order would have claimed it and probably would have canonized the discoverer.

iii. The third essay treats of the early use of cinchona bark on the continent of Europe and in England, and begins by pointing out that according to a letter written by a Spanish physician, D. Joseph VILLEROBEL, and quoted by Sebastian BADUS in his Anastasis Corticis Peruviae seu Chinae Chinae Defensio, the bark was first brought to Spain in 1632, and not, as is commonly believed, by the Countess of Chinchon in 1640. The author then gives an account, replete with humour, of the controversies over the utility of the new drug; for, like some other great discoveries, from the days of William HARVEY to those of Joseph LISTER, the discovery of cinchona was at first treated with considerable reserve by the profession. The pope, the Jesuit monopoly, and the enormous prices given for "Jesuit's Powder" are mentioned, and a good deal of attention is given to the manner in which the bark was administered, and its effects explained and criticised, by SYDENHAM and his contemporaries. The author recognizes in SYDENHAM's final advocacy of small and frequent doses in the period of intermission "a method which, in the case of quinine, is now being employed by the foremost authorities on malaria."

A. Alcock.

i. BREINL (A.) & PRIESTLEY (A.). **Malaria contracted in New Guinea by Members of the Expeditionary Force and its Treatment.**—*Med. Jl. Australia.* 1916. Jan. 29. Vol. 1. 3rd Year. No. 5. pp. 91–95.

ii. MEDICAL JOURNAL OF AUSTRALIA. 1916. Jan. 29. Vol. 1. 3rd Year. No. 5. p. 106.—**The Malaria Problem.**

i. This is a critical paper reviewing the known behaviour and microscopical features of the several malarial parasites, and the clinical treatment of malarial fever, in relation to thirty cases where in spite of free use of quinine recurrences of fever were long persistent. In 13 of the cases malarial parasites were found, in eight there was only clinical evidence of latent malarial infection, and in nine there was merely a history of repeated attacks of intermittent fever.

The authors conclude that in every case treatment must be adapted to the individual, after the type and severity of the infection has been

determined, and that for a permanent cure large doses of quinine must be continued for a prolonged term. A cure may be facilitated by the auxiliary employment of organic preparations of arsenic.

ii. An abstract of the deliberations of a conference held in Sydney to consider the best means of dealing with soldiers returned from service in malarious regions abroad.

The conference came to the conclusion that—apart from the areas where malarial fevers and the conditions that give rise to them are already known to exist—there are, so far as present information goes, only three places in the Commonwealth, namely Cairns and Port Douglas in Northern Queensland and Overland Corner in South Australia, where Anopheles are much concentrated, and that only in Overland Corner is there any contingency of the Anopheles becoming infected from returned soldiers still harbouring malarial infection.

The conference recommended, *inter alia*, that an Anopheles survey of the irrigation districts of the Murray and Darling Rivers should be undertaken, and that all returned soldiers who have been infected on foreign service should be segregated in one place where they should undergo a specified course of treatment, their pay being continued for three months.

A. A.

von Ezdorf (H.). **Endemic Index of Malaria in the United States.**—*U.S. Public Health Rep.* 1916. Mar. 31. Vol. 31. No. 13. pp. 819–828.

The original parts of this paper consist mainly of tables and summaries relating to the malaria-index, as determined by blood-examination, in six of the Southern states, namely Alabama, Arkansas, North and South Carolina, Mississippi, and Virginia, during the years 1912–1915. Of the 13,526 blood-examinations made 13·28 per cent. showed malarial parasites (8·08 per cent. among whites, 20·6 per cent. among coloured people), the percentage of these carriers being highest among the one to three-year-olds, and lowest among the ten to 14-year-olds. The extremes of age in which infection was observed were 9 months and 85 years. The prevalent type of infection was benign tertian. It is estimated that gametocytes were present in one of every four of the infected.

A. A.

Armand-Delille, Paisseau & Lemaire (H.). **Notes sur quelques cas de paludisme primaire observés en Macédoine.**—*Bull. et Mém. Soc. Méd. des Hôpit. de Paris.* 1916. Mar. 3 ser. 32 Ann. No. 7–8. pp. 281–289.

In these notes of cases of primary malarial infection of soldiers of the French expeditionary force in Macedonia six variations from the ordinary type of malarial fever were noticed, and the authors comment on the difficulty of diagnosis apart from a systematic investigation of the blood for malarial parasites. In the commonest variety—a benign tertian infection—the most prominent symptoms were those of gastric derangement. In another class, also benign tertian, the initial symptoms and signs suggested localised inflammation of a lung. In another, malignant tertian, the patient was comatose, profoundly anaemic and

somewhat jaundiced. In another, also malignant tertian, in addition to coma, rapid anaemia, and violent headache, the patient had tremors and at times was semi-delirious. In another, also malignant tertian, these typhoid symptoms were followed by persistent loss of memory and mental troubles. One case was truly typho-malarial, *Plasmodium vivax* and *Bacillus paratyphosus* A being coexistent in the blood.

A. A.

RATHERY (Francis) & MICHEL (R.). **Le paludisme dans un coin des Flandres.** — *Paris Méd.* 1916. Apr. 22. Vol. 6. No. 17. pp. 394–402. With 15 charts.

Flanders having been in former times notorious for terrible epidemics of malarial fever, it was reasonable to fear that the recent massing of troops there—some of them brought direct from infected regions—and their deadly life in trenches in country much of which had, for strategic reasons, been inundated, would have duly been followed by an epidemic of malaria. That this did not happen may be attributed to the perfect (*merveilleux*) sanitary conditions resulting from the judicious and extremely thorough hygienic precautions taken. A few cases, however, have occurred, and this paper contains an abstract of 28 that fell under the authors' observation between February and December (1 each in February, May and December; 2 in July; 3 in September; 6 each in June and August; 8 in October) in all of which the diagnosis was specifically verified by examination of the blood, nine of them being subjects who had never been exposed to the risk of malarial infection before, and the antecedents of six being doubtful in this particular.

[Twenty-nine cases in which the examination of the blood was negative or the diagnosis otherwise dubious are mentioned.]

In some of the 28 cases rosettes were found and in one case crescents, but in most only amoeboid forms were seen. The clinical types were simple intermittent; continuous with exacerbations and with typhoid tendencies; malignant, simulating typhoid (one case, a primary infection); haematuric with bilious vomiting (two cases, both having lived in the colonies), and what the authors call "larval" forms of malaria, where the suggestive symptoms are gastro-intestinal, or bronchitic, or pulmonary; finally, in two cases, *Bacillus paratyphosus* B was also found in the blood.

All the cases yielded to quinine, though generally it was necessary to resort to [? hypodermic] injection, which did not cause unbearable pain.

A. A.

RANKIN (A. C.). **Simple Tertian Malaria in French Flanders.**— *Lancet* 1916. May 27. pp. 1079–1080.

An interesting paper, showing that the presence among the British forces in Flanders of men who had recently been in a malarious country and in some instances were actually known (by blood-examinations made between April and the middle of July) to be infected with malaria, was followed (between July 26th and November 19th) by infection of men who in some instances had never been out of the British Islands before.

It was known to the writer that malarial fever was common in Flanders in former times, and also that an approved carrier-mosquito (*Anopheles maculipennis*) was active on the spot, but he considered that the infection of the insect would be hindered by the climate.

It is an interesting confirmation of established doctrines that though of the men who carried the infection into Flanders some—the great majority of those examined—harboured *P. vivax* and some—a very few of those examined—*P. malariae*, the men who contracted the infection in Flanders for the first time all had *P. vivax*.

A. A.

GENOVESE (Francesco). **Il bacino malarico del Neto e il Marchesato cotronese.** [The Malarial Basin of the Neto, and the Marquisate of Cotrone.]—*Malariologia.* 1916. Feb. 29. S. 2. An. 2. No. 1. pp. 10–22.

An interesting account of the present state of the ancient town of Crotona, in the south of Italy, famous for its strong men, like Milo, and for the ability of its physicians. The whole district of which Crotona, the modern Cotrone, is the centre, is ravaged by malaria, and the condition of the inhabitants is miserable in the extreme. The country is chiefly cultivated by migratory labourers.

J. B. Nias.

O'CONNELL (Matthew D.). **The Meteorology of Malaria. Disappearance of Malaria from England.**—*Jl. Trop. Med. & Hyg.* 1916. Mar. 15. Vol. 19. No. 6. pp. 65–68.

The author of this paper is not altogether disposed to accept the generally received opinions that the malarial fevers so common in certain parts of England in former times were caused by blood parasites transmitted by mosquitoes, and that the freedom of England from malarial fevers at the present time is due to the banishment of malaria-carrying species of Anopheles from houses by a general improvement of sanitary conditions.

His argument is that since malarial parasites are still imported annually in abundance by infected persons returning from malarious countries, and since malaria-carrying species of Anopheles are still common in those parts of England that used to be malarious, the disappearance of malarial fevers must be due to some other independent cause. The unqualified verbal predicates that both "malarial parasites" and "Anopheles mosquitoes" may still be found in England are quite sufficient for the author's argument: the crucial question whether human beings harbouring parasites of a particular species and Anopheles mosquitoes that are hospitable to that particular species are common occupants of dwelling-houses at the present time—either together or even singly—anywhere or at any season in this country is ignored.

In his search for a cause independent of malarial parasites and Anopheles mosquitoes the author at any rate succeeds in illustrating the whimsical conclusions that may be reached by pure deductive reasoning when the premises are not based on fact.

Starting with an assumption that there is some direct relation between body-temperature and the physical conditions of the

atmosphere, the author concludes that a hot, humid, and stagnant atmosphere causes a rise of body-temperature which is synonymous with fever.

The conclusion reached from this fallacious assumption is then manipulated to explain that since a rise of body-temperature is the direct result of heat combined with humidity of atmosphere, and since the atmosphere of the English fen-country, formerly so malarious and humid, has become less humid as a result of drainage, therefore the disappearance of malarial fevers from the fen-tracts is directly due to the reduced humidity of the atmosphere.

The author believes that atmospheric conditions which raise body-temperature above normal do still occur in this country—though seldom—in the months of July, August, and September. Still more seldom they may recur on consecutive days, or on the second or third day, and thus are to be explained those rare cases of intermittent fever and ague in persons who have never been out of England. But the author does not explain why such cases should necessarily be rare, since by the hypothesis one would expect a large part, if not the whole, of the population of the particular locality exposed to the postulated conditions to be equally affected.

A. A.

Di Pace (I.). **Per la diagnosi della malaria latente.** [The Diagnosis of Latent Malaria.]—*Morgagni.* 1915. July. Vol. 57. Pt. 1. No. 7. pp. 266–280; Aug. No. 8. pp. 281–308.

The author, in this paper, passes in review the various attempts which have been made to diagnose latent malarial infection by means of deviation of complement and points out their want of success. He then draws attention to the use of the salts of berberin, and strychnine as diagnostic agents. Both are reputed to cause contraction of the spleen, and in this way to expel into the blood stream any parasites which may be lurking there. A positive result is evidenced by fever, or the parasites may be detected by a blood examination with the microscope. The dose of berberin is from ·80 to 1·0 gramme of the chlorhydrate for an adult, and half that quantity for children. The dose should be repeated for four doses at hourly intervals. By this means the author was able to get a positive result in 9 out of 16 persons who gave a history of having had malaria. The salt of strychnine preferred by the author is the nitrate, which should be given hypodermically in doses of 2 to 3 milligrammes for an adult, or by the mouth in doses of 2 to 4 milligrammes. The number of persons tested by the author in this way amounted to 136, with a positive result in 38, or 27 per cent. The blood, if examined, should be taken from the lobe of the ear from one to two hours after the dose of strychnine or berberin.

J. B. N.

Armstrong (E. Randolph). **The Value of Differential Blood Counts in the Diagnosis of Malaria.**—*Ann. Trop. Med. & Parasit.* 1916. Apr. 29. Vol. 10. No. 1. pp. 85–130.

A lucid and discriminating paper, tabulating, correlating, and generalizing observations extending over a term of 21 months, and

properly ratified by exact definitions of terms and by specification of errors actual and contingent. The conclusions expressed by the author are that the increased proportion of large uninuclear leucocytes in malarial blood is a phenomenon so constant as to be trustworthy evidence of malarial infection, and so persistent as to be proof of infection after the parasites have disappeared from the blood stream and can no longer be discovered by feasible methods.

The differential characters accepted for the large uninuclear leucocyte are, that it must be at least as big as the largest polymorphonuclear visible; that the nucleus, which is woolly in appearance and either ovoid or reniform but very rarely squarish and *never circular*, must show less depth of stain than the nucleus of any other white cell in the film (excluding the mast cell when its nucleus fails to stain), the colour, with Leishman's stain, being of a cherry-violet as opposed to the bluish-purple of the large lymphocyte; chromatin granules should be present (but may be obscured by the nucleus), usually as triangular chips, but sometimes as dots, to a number rarely exceeding ten; the protoplasm should be clear, either not stained or faint blue, and if the protoplasm have escaped by rupture the envelope remains recognizable; furthermore, in malaria, pigment can often be seen within the protoplasm. Two rare cells—the transitional and the endothelial—were numbered with the uninuclears. "Broken" nuclei present a difficulty, for though their presence in excess is said to be due to rough manipulation they cannot be altogether avoided; the author should perhaps have been content to state the fact that he observed them to be more numerous in malarial than in other blood and to take the same shade of colour as the nuclei of the large uninuclears, for his other arguments for assigning them to the uninuclears merely beg the question.

A. A.

LEIGHTON (W. E.) & MOELLER (Fred). **A Case of Spontaneous Rupture of the Malarial Spleen.**—*Jl. Amer. Med. Assoc.* 1916. Mar. 4. Vol. 66. No. 10. pp. 737–738.

The patient was admitted into one of the General Hospitals of the British Expeditionary Force from the trenches, where he had been taken ill with "chills," fever, headache, and pains in the abdomen and chest. On his way to the hospital he had a severe attack of pain, beginning in the epigastrium and spreading over the whole abdomen.

The only notable events in his past history were a severe attack of dysentery, preceded by sudden abdominal cramps and followed by "chills," which had occurred in India three years before; an attack of "chills" and fever while on his way back to England two years after that; and an attack of vomiting, which lasted for two days, when he landed in England.

On admission he was wasted and anaemic, with a subnormal temperature. There was dulness of the lower part of the right side of the chest, some displacement of the heart to the left, and tenderness over gall-bladder, epigastrium, and appendix.

The symptoms for two or three days after admission were fever and frequent attacks of pain simulating gall-stone colic, terminating, after a very severe attack, in collapse. An examination of the blood gave

a leucocyte count of 10,500, with 55 per cent. polymorphonuclears, 40 per cent. small uninuclears, and 5 per cent. large uninuclears—no malarial parasites.

An exploration of the abdomen, on the morning after the severe attack, revealed much old blood clot and dark fluid blood, and many adhesions, the omentum being infiltrated with blood and adherent to liver, spleen, and intestine. The spleen was enlarged and soft, and a few mesenteric glands were enlarged. Except that the liver was slightly enlarged and the stomach congested, these organs, as well as the gall-bladder and pancreas, were normal.

The adhesions between spleen and omentum were not disturbed, but the appendix was removed.

The operation-wounds were drained and dressed, and the patient was doing fairly, when lobar pneumonia complicated the case. This went on satisfactorily to crisis and rally.

In the early days of convalescence "chills" and fever supervened, and malarial parasites were then found in the blood.

After treatment with quinine the patient made an uneventful recovery, and was sent to England, with the operation-wounds healed except for two small sinuses, about six weeks after his admission to the General Hospital.

A. A.

da Matta (Alfredo A.). **Soluço e hyperesthesia plantar intermittentes (Paludismo Larvado).** [Intermittent Hiccup and Plantar Hyperaesthesia in a Case of Masked Paludism.]—*Arch. Brasileiros de Med.* 1916. Jan. Vol. 6. No. 1. pp. 76–78.

Notes of the case of a man, aged 39 years, who was admitted to hospital for pains in the hepatic region and gastric disturbance. By trade he was a boatman and had been in the habit of sleeping in the open air, but could give no history of malarial attacks. Treatment was commenced with cholagogue purgatives and naphthol enemata but on the third day an attack of severe hiccup supervened, which occurred at intervals for several days following. On the fifth day after entry into hospital the patient began to complain in addition of intense pain and burning on the soles of the feet, sufficient to prevent locomotion. This passed off at night, to recur on the following day. The blood was then examined and found to present an excess of polynuclears and large mononuclears, while the urine also exhibited traces of bile, urobilin, and albumin. On these findings a diagnosis of masked paludism was made, and an injection of half a gramme of quinine was given at once, followed by smaller doses by the mouth, along with fluid magnesia. On this treatment the hiccup and hyperaesthesia promptly disappeared.

J. B. N.

Lafora (Gonzalo R.). **Afecciones nervosas consecutivas al paludismo.** [Nervous Affections supervening upon Malaria.]—*Siglo Med.* 1916. Feb. 12. Vol. 63. No. 3244. pp. 99–101.

An account of a case of cerebral disturbance supervening upon malaria.

The patient was a man aged 34 years, who for six months had suffered from malaria. In spite of taking quinine, the paroxysms had continued. Difficulty in walking and giddiness then began to be noticed. The gait

was ataxic, Romberg's sign being well marked. Patellar and ankle reflexes were augmented, but equal on both sides. Foot clonus present. Babinski, Mendel and Oppenheim's signs were negative. The hands exhibited slight ataxia and tremor, and the tongue was tremulous. Pupils normal; fundus the same, but for a slight papillary oedema. Speech slightly stammering. On performing lumbar puncture, 18 cc. of cerebro-spinal fluid escaped under much pressure and exhibited distinct lymphocytosis. After the puncture, 40 centigrammes of quinine were given intravenously, and also arsenic by the mouth. Intense headache, for two days, followed the puncture, but was relieved by pyramidon.

The patient immediately afterwards began to improve, the ataxia and vertigo disappearing completely. Three days later another lumbar puncture only gave exit to cerebro-spinal fluid in drops, upon coughing. The case was still under treatment at the time of writing.

The author believes that these cases will be very frequently found if looked for. A bibliography of recent works on the subject is appended.

J. B. N.

FERGUS (Freeland). **Malaria and Fundus Changes.**—*Ophthalmic Rev.* 1916. Feb.–Mar. Vol. 35. Nos. 412–413. pp. 37–50.

A discussion of two cases of optic neuritis and retinal congestion, in one of which the patient long had lived in India and had suffered severely from ague at times during twelve years, the other being a soldier who had never been in the East or suffered from malaria until he was sent to fight in Gallipoli. In the first case the author attributes the condition of the eye to malaria mainly by a somewhat hesitating process of exclusion; in the second he expresses his suspicion of malaria with even less confidence.

A. A.

JOB (E.) & HIRTZMANN (L.). **Paludisme et quinine.**—*Bull. et Mém. Soc. Méd. des Hôpit. de Paris.* 1916. Mar. 23. 3 Ser. 32 Ann. No. 9–10. pp. 337–343.

This paper is in the main a vindication of quinine—" un médicament merveilleux " in malaria. It generalizes 222 cases treated at Casablanca in Morocco, the diagnosis in every case being confirmed by examination of the blood. Except in cases of gastric intolerance or of pernicious complexion the authors give quinine (hydrochlorate) by the mouth, and their idea seems to be to keep the patient soaked in quinine by frequently repeated doses of moderate strength rather than to torpedo the parasites with enormous doses. The dose they recommend is 0·25 gramme administered as follows: During the first two days one such dose every four hours, during each of the next four days four such doses, and on the seventh day none. During the second week four doses daily for five consecutive days. During the third week four doses daily for four consecutive days, and thereafter four doses daily for three consecutive days of every week, until the blood is normal.

The authors have never encountered parasites resistant to quinine thus administered, and they think that if the treatment be begun within eight or ten days of infection and before the development of gametes the patient's blood becomes " sterilized " after three or four weeks. If gametes are present the treatment must be continued.

The authors write with some reserve about the prophylactic use of quinine; what they consider adequate is 2 grammes a week taken during two consecutive days in doses of 0·25 grammes every six hours.

A. A.

DEEKS (W. E.). **Treatment and Complications of Malaria.**—*Southern Med. Jl.* 1916. May. Vol. 9. No. 5. pp. 420–426.

This paper generalizes the experience of about 50,000 cases of malarial fever treated under the author's supervision in the Canal Zone during seven years. Eighty per cent. of the cases were malignant tertian, only 1 per cent. was quartan.

"One specific drug is known for the treatment of malaria, and that is quinine" is the author's widest generalization. "In the vast majority of cases administration by the mouth meets every requirement" is another broad conclusion, coupled with the proviso that it be given in solution, and not in pills or tablets.

In ordinary cases the best results were obtained by giving 15 grains three times daily until the temperature had remained normal for three or four days, when the dose was diminished to 10 grains three times daily for a week, and then to 20 grains daily for another week. These large doses were for the most part tolerated. On the day of admission a routine treatment of three grains of calomel followed in eight or ten hours by an ounce of Mag. Sulph. was followed.

In pernicious cases with cerebral congestion the hypodermic method was generally adopted, 7½ grains of dihydrochloride dissolved in 10 cc. of normal saline being injected at intervals of two to four hours, up to a total of 45 to 75 grains.

In some cases of severe infection solutions of quinine diluted "from 250 to 300 times with normal saline" were injected into a vein.

In some grave cases with severe and persistent vomiting and evidences of portal congestion 60 grains of quinine dissolved in 10 or 12 ounces of warm saline injected per rectum gave good results.

In all cases where the drug was injected in any fashion administration by mouth was resumed as soon as possible.

The commonest complication of the quinine treatment was urticaria, sometimes going on to dermatitis, or even, though rarely, to extensive desquamation. Hypodermic injection sometimes led to necrosis in very weak points, but not in normal patients after local massage and the application of a hot bottle. An attack of haemoglobinuria "not infrequently" occurred, sometimes after the administration even of a very small dose of quinine.

The most frequent complication of the disease observed was nephritis, which in the great majority of cases disappeared after convalescence, though sometimes it persisted and ended fatally, with necrosed foci in kidneys, liver, and spleen. Another complication was haemoglobinuric fever, 230 cases of which have already been summarised in a report. Haemorrhages into mucous membranes and extensive purpura were also observed, and jaundice, bronchitis, and anaemia were not uncommon.

A. A.

WRIGHT (T. E.). **Treatment of Malaria Relative to its Eradication.**—*Southern Med. Jl.* 1916. Apr. Vol. 9. No. 4. pp. 313–316.

The author, while realizing the position of the general practitioner, points out that the treatment of malarial fever should include in its scope the prevention of infection by diminishing the number of human "carriers." From his own experience he concludes that intravenous quinine is the likeliest method of "sterilizing" the blood in malaria, and he recommends ten-grain doses dissolved in 20 cc. saline or fresh-distilled water—to be repeated in eight or ten hours once or oftener according to the case—the only contra-indication being pregnancy. The discomfort to the patient is slight, and in 258 cases no unfavourable effects were noticed, while the direct therapeutic results were prompt, constant, and entirely satisfactory.

A. A.

MINERVINI (R.). **Splenectomia per Milza malarica.** [Excision of a Malarial Spleen.]—*Giorn. Intern. d. Sci. Med.* 1915. Dec. Vol. 37. No. 23. pp. 1057–1063.

Notes of a case of successful removal of a hypertrophied malarial spleen.

The author remarks that the removal of malarial spleens should not be attempted until there is reason to believe that they are no longer functional, from degenerative changes, by which time other haemopoietic organs, like the bone marrow and the lymphatic glands, have had time to take on the function of the spleen. In addition it is a distinct advantage, from the operative point of view, to wait until there is an evident prolapse of the spleen, so as to get a good pedicle for ligature. Both these conditions were present in the case under review.

J. B. N.

KING (W. V.). *Anopheles punctipennis*, **a Host of Tertian Malaria.**—*Amer. Jl. Trop. Dis. & Prevent. Med.* 1916. Feb. Vol. 3. No. 8. pp. 426–432. With 1 plate.

The experiments recorded in this paper were conducted in New Orleans, in one of the laboratories of the School of Medicine of Tulane University. The mosquitoes used were bred in the laboratory, and the specific identifications were confirmed by Mr. KNAB, whose word must be taken as final.

The record shows that of six specimens of *Anopheles punctipennis* fed on a patient whose blood was particularly rich in gametes of the benign tertian form (this being their first feed of blood) five became infected. In the series of five every phase of the sporogeny was traced, from zygotes to sporozoites, the sporozoites being observed on the twentieth day after the original feed.

The record also contains the interesting item that a single specimen of *Anopheles punctipennis* fed on a patient not so heavily infected as the first was found, twenty days after, to contain three oocysts—two unripe and one empty—and some sporozoites in the tip of one lobe of one salivary gland.

A footnote contains the information that, more recently, *A. punctipennis* has been discovered to be an efficient host for the subtertian parasite, the details of the discovery being promised.

The fact that *A. punctipennis* is hospitable to the malarial parasite in New Orleans, although competent workers have failed to infect it in other parts of America, has a significance of very wide application.

A. A.

MITZMAIN (M. Bruin). *Anopheles crucians.* **Their Infectibility with the Parasites of Tertian Malaria.**—*U. S. Public Health Rep.* 1916. Mar. 24. Vol. 31. No. 12. pp. 764–765.

It has been stated, on the strength of experiments made in New Orleans in 1902, that the only species of malarial parasites that can develop in *Anopheles crucians* is *P. falciparum.* The experiments recorded in this paper, however, which also were made in New Orleans, do not confirm this limitation of the powers of *A. crucians*, since they give detailed evidence that this mosquito can also be hospitable to the parasite of benign tertian.

Of 19 specimens of *A. crucians* fed on a patient suffering from this form of malarial fever seven died within five days, and three of these seven were found to contain immature zygotes, while in a fourth the vermicule stage was identified. Of the 12 survivors, two were found, on the eleventh and twelfth day after, to have sporozoites in the salivary glands, the infection in one case being heavy.

Of 38 specimens of *A punctipennis* fed on the same patient 11 became infected six to sixteen days after, the infection of the salivary glands in six of the specimens being very extensive. And of two specimens of *A. quadrimaculatus* fed on the same patient neither became infected.

These interesting experiments teach once more the need of reiterated experiment and prolonged suspension of judgment in determining the relations of any particular species of Anopheles to malaria.

A. A.

MITZMAIN (M. Bruin). **Tertian Malarial Fever. Transmission Experiments with** *Anopheles punctipennis.*—*U. S. Public Health Rep.* 1916. May 12. Vol. 31. No. 19. pp. 1172–1177.

The experiments here recorded in detail not only confirm those of W. V. KING as to the infectibility of *Anopheles punctipennis*, but also cap them by demonstrating, what easily-satisfied people might take for granted, that the infected *punctipennis* is most potently infective. Three healthy volunteers submitted themselves to the voracity of certain individuals of *punctipennis* that had been infected, some ten, some fourteen days before, from a case of benign tertian ; in all three after an incubation period of 14 days the usual pathognomonic symptoms were displayed and the specific parasites were discovered in the blood. As one of the volunteers had been employed some months before in giving suck, without any ill effect to himself, to individuals of *punctipennis* that had been used in an attempt to transmit the subtertian parasite, the author is inclined to suspect that this mosquito may be inhospitable to *P. falciparum.*

A. A.

HOFFMANN (Frederick L.). **A Plea for a National Committee on the Eradication of Malaria.**—*Southern Med. Jl.* 1916. May. Vol 9. No. 5. pp. 413–420.

For the United States Registration area, which excludes practically the entire rural South, the malaria mortality is 2·6 per 100,000, and for nine representative Southern cities it is 22·1 per 100,000. From calculations and probable assumptions, for which these figures serve as the specific data, the author estimates that in the entire continental area of the United States there occur annually 1,035,000 cases of malaria with 15,520 deaths. Comparative statistics from the records of specified areas reveal the fact that improvements in sanitation have diminished the malaria-mortality in those areas, and while the author admits that much has already been done sporadically and tentatively, he would like to see organized and comprehensive national machinery at work for the abatement and eradication of malaria over the whole country. As a model he suggests the Malaria Bureau of the Indian Government, to include within its scope education, surveys, biological research in its widest sense, statistical studies, and general problems connected with engineering, municipal administration, legislation, etc.

A. A.

von EZDORF (R. H.). **Demonstrations of Malaria Control.**—*U. S. Public Health Rep.* 1916. Mar. 10. Vol. 31. No. 10. pp. 614–629. With 4 figs.

An interesting record of improvements effected in two small townships by treatment of the breeding-places of Anopheles. Roanoke Rapids, in North Carolina, with its two neighbouring villages spreads over an area of about four square miles; the population in 1913 was 4,100, mainly white, employed for the most part in cotton and paper mills. In 1913, before the institution of anti-malaria measures, malarial fever was prevalent in the summer months, the cases visited by local practitioners averaging 50 per diem, and of 400 general blood-examinations made at the end of the fever season 13·75 per cent. showed malaria parasites. Anopheles larvae, chiefly *A. quadrimaculatus*, were found in almost every pool, rivulet, and marshy place investigated, and adults of the same species were common in the houses. Popular lectures and school-instruction were given, the streams were cleared of brush, ditches were levelled and cleaned, oil-drips were installed where necessary (and also many inhabitants were induced to use quinine during the fever season). As a result, in 1914 only a few Anopheles larvae were to be found, and 780 general blood-examinations made at the end of the malaria season showed only 4·48 per cent. of infections, while in 1915 only a few adult *Anopheles punctipennis* were noticed, the number of cases of malarial fever attended was estimated roughly as one in three days, and in 968 blood-examinations made as before the percentage of infection was only 3·51. The total cost of ditching, clearing, oiling, inspection, etc. was, in the year 1914, 3,683 dollars, and in the year 1915, 1,233 dollars, which, probably, was more than balanced by the value of the labour reclaimed for the mills during the fever season. As a sort of "control" it was observed that among some coloured people living outside the area of the anti-malaria operations 30 general blood examinations made at the end of the malaria season of 1915 showed 20 per cent. of infection.

Electric Mills in Mississippi is a town of timber-mills, in low-lying wooded country, with a good deal of sluggish and stagnant water; the population ismixed, the white residents having their own separate quarter. In September 1912 malarial fever is said to have aggregated 95 per cent. of the total sickness. In 1914 Anopheles larvae were found in many places, and 527 general blood-examinations made in May showed 11·76 per cent. of malaria infection. Drainage was improved, hollows were filled in with shavings and sawdust, and some oiling was carried out, with a result that in April 1915 examination of the blood of 211 persons showed only 3·79 per cent. of infection. The cost of the anti-malaria operations in 1914 was 725 dollars, and in 1915 143·80 dollars.

A. A.

SERGENT (Edmond et Etienne). **Alternance des écoulements d'eau, principe directeur des mesures antilarvaires.**—*Malariologia.* 1916. Feb. 29. S. 2. An. 2. No. 1. pp. 3–9. With 4 figs.

The authors quote the saying of the Algerian colonists, that "in Africa where there is no water one dies of thirst, or, where water exists, of fever," as a text to show that these alternative disasters can be avoided by irrigation so planned as to prevent the breeding of Anopheles mosquitoes. This can be effected by having the irrigation channels double, so that each channel can be used alternately for a term considerably less than is necessary for the complete development of an Anopheles larva, which in the Algerian summer is three weeks. While the one channel is in use and young larvae may be thriving in it as if no doom were impending, the other dries up and the larvae which have been flourishing in it perish untimely, provided, of course, that its intake had been kept down strictly to the ascertained requirements of irrigation.

In the villages of the colony places for bathing and washing and for watering animals must be kept under surveillance, and useless and intractable channels must be filled in or petrolised.

The idea is obviously sound, but it implies high standards both of intelligence in the colonists and of vigilance, as well as technical efficiency in the irrigation department.

A. A.

BERTOLIO (S.) & MARIANI (A.). **Contributo sperimentale allo studio delle profilassi anti-anofelica.** [An Experimental Contribution to the Subject of Mosquito-Destruction.]—*Morgagni.* 1915. July. Vol. 57. Pt. 1. No. 7. pp. 259–265.

On account of the high price of petrol at the present time, the authors have been experimenting with heavy oil, such as is used in Diesel engines, as a larvicide. They find that a mixture of nine parts of such an oil, of a density of ·925, with one of petrol, makes a good proportion. It should be poured upon the water on a hot, calm day so that it may spread uniformly, and the film lasts so long that it is not necessary to apply it to any collection of water more than twice in the year. Naturally such a film is liable to kill fish and to clog the plumage of water-birds, so that it has its drawbacks, but as it is necessary to

apply petrol to surfaces of water once a fortnight at least while the mixture needs to be renewed only twice a year, the cost works out, in Italy, at about only one-tenth that of pure petrol. An Italian heavy oil, of a density of ·785, gave equally good results.

J. B. N.

CARTER (H. R.). **Malaria. Lessons on its Cause and Prevention. For Use in Schools.**—*U. S. Public Health Rep.* Suppl. No. 18. Revised Edition. 1915. Jan. 20. 20 pp. With 23 figs.

In describing what Anopheles mosquitoes are like, where they are found in nature, and how they and their eggs and larvae may be distinguished from mosquitoes of other kinds, and in explaining how by destroying these insects and abolishing or vitiating their breeding-places—as well as by other easily understood means—malarial fevers can be prevented, the object of this illustrated school-catechism is highly to be applauded, and its execution is as much to be admired; the facts can be demonstrated by a capable teacher, and the inferences lie within the limits of a child's mental reach. But the descriptions and figures of malarial parasites, in all stages of their existence, are not so satisfactory; and it is difficult so see how any profitable end, either educational or utilitarian, is to be gained by the introduction of things so remote from the verifiable experience and the assimilative capacity either of school children or of ordinary school teachers.

A. A.

HAY (G. G.). **First Measures in Malaria Prevention for Farmers and Settlers. The Role of Nature in the Suppression of Malaria.**—*The War on the Mosquito.* Publication No. 11.—45 pp. With 20 figs. S. African Anti-Malarial Association.

Here we have the truth about malaria embodied in a tale that shall enter in at lowly doors, so that he may read that binds the sheaf or builds the house in new-settled tracts.

The author explains the cause of malarial fever, the manner of its transmission, and the usual permanent source of infection for the white man, and describes the appearance and habits of different kinds of mosquitoes and their larvae, and then discusses the choosing of a site, the planning of a house, the treatment of surroundings, and the management of water, so as to escape and to suppress mosquitoes. Much useful advice is also given, on the one hand about screening, mosquito-nets, and mosquito "swatting," and on the other hand about the habits of life, personal hygiene, clothing, and ways of using quinine. Among the illustrations that of a group of Anopheles larvae is particularly good.

If the actions of men were determined by knowledge and reason, this instructive and persuasive pamphlet might banish malarial fever from South Africa.

A. A.

HAY (G. G.). **Malaria Prevention on Active Service. Notes for the Information and Guidance of the Union Troops on Service in Central and East Africa.** [Also in Dutch.]—*The War on the Mosquito.* Publication No. 14.—18 pp. With 6 figs. S. African Anti-Malarial Association.

This little pamphlet explains in simple language the nature and the mode of transmission of malaria, and something of the habits and appearance of the Anopheles mosquito, so as to make it plain to the most ordinary intelligence that malarial fever can be avoided under service conditions by individual attention to certain precautions. Different kinds of mosquito-nets, and simple methods of adapting them to the exigencies of service are described, as well as other means of protection from mosquitoes. Some useful repellent applications are mentioned, and the preventive use of quinine is advised.

A. A.

MALCOLM (William). **The Term "Malaria" and its Colloquial Synonyms.**—*China Med. Jl.* 1916. Mar. Vol. 30. No. 2. pp. 97–99.

This interesting paper contains some choice examples of the flowery rhetoric of the far east; of the twenty-two idioms for malaria some, such as "that heavenly thing," are euphemistic; some, like "devil sickness," maledictory; others, like "the every third day cloud," poetical; and one, "the honorable official," is blandly sarcastic and almost defamatory; a few, such as "the mixed infection" are as unexpectedly pregnant as some of Hamlet's replies to Polonius.

A. A.

RELAPSING FEVER AND OTHER SPIROCHAETOSES.

RUDIS-JICINSKY (J.). **Relapsing Fever in Serbia.**—*New York Med. Jl.* 1916. Apr. 1. Vol. 103. No. 14. [Whole No. 1948.] pp. 643–645.

The author recounts his experiences in Serbia in the neighbourhood of Uskub. He states that "the sanitation was about at zero." There were many cases of relapsing fever in winter contemporaneous with an epidemic of typhus. Microscopic examinations of the blood were made for spirochaetes, which were seen during paroxysms in some cases, but disappeared before the crisis in others. Sometimes inoculation of rabbits was performed. The author and two colleagues became infected, and one succumbed. Neuritis of the extremities sometimes occurred as a sequel. His own symptoms are described. Often the cases showed three pyrexial stages with marked discolouration of the skin. Complications in wounded or in those also affected with typhus are briefly recorded. Lice were the carriers of infection. In the majority of cases there was only one relapse and the malady lasted 18 to 20 days.

"The treatment and general management were simple, including time and use of stimulants and tonics, especially iron, strychnine, and quinine, opposing fever by cold, or applications of snow, brought from the hills far away. We gave Dover's powder for pain or morphine for sleeplessness, if necessary subcutaneously." Good nursing was employed, and care was taken to prevent access of lice to the person.

A. Porter.

DANILA (P.). **Fièvre récurrente à Bucarest.**—*C. R. Soc. Biol.* 1916. May 20. Vol. 79. No. 10. pp. 458–460.

The author has observed two large and one small focus of relapsing fever in Bucharest this spring. In the first centre of infection, 6 out of 11 persons in an unhealthy house became ill. Spirochaetes were found in three during the second relapse but were not looked for in the remaining three cases. In the second centre 40 persons were living in an old house, one fell ill and spread the malady among the others, probably by means of lice. Fourteen persons became infected, of whom three had one relapse, eleven had two, and one had a third relapse. Spirochaetes were found in the blood of ten of the fourteen cases. Two of the patients, before being isolated, formed a third centre of infection for four other persons. Of the latter, three showed spirochaetes in their blood and each had two relapses.

The source of this epidemic has not been determined. All the patients were peasants who had not been away from Bucharest for some months, and it is probable that they had contracted the disease in the city. Refugees from Balkan countries have brought relapsing fever with them to Roumania, but it has been unrecognised until now, being confused with other maladies. Other probable cases of relapsing fever have occurred. The first case in which *Spirochaeta recurrentis* was proved to be present was that of a doctor, who contracted the disease on the Bulgarian frontier in February 1916.

Cultures made on Noguchi's medium gave an abundant growth of spirochaetes in 15 hours. Further details of the culture are promised later.

A. P.

PRUESSIAN. **Ueber eine mit Neosalvarsan behandelte Rekurrens-Epidemie.** [An Epidemic of Relapsing Fever treated with Neosalvarsan.]—*München. Med. Woch.* 1916. Mar. 7. Vol. 63. No. 10. pp. 344–348. With 16 curves.

The author, who was attached to the Eastern German army, observed an epidemic of relapsing fever in a prison-camp for Russians. There were 127 cases in April, while from the middle of May to the middle of June there were 380 sick. The epidemic was spread by lice. Of those treated, 90·7 per cent. were permanently cured by treatment with salvarsan, but only 54 cases were treated from the commencement of the illness. After the injection the fever remained only two to four days. One patient, who also suffered from malaria, died.

The treatment with neosalvarsan is stated to have been by adding an ampoule containing 0·45 gram of the drug to 10 cc. of sterile distilled water and inoculating it into a vein of the arm.

The curves show the effect on the temperatures of patients when under drug treatment.

[In the title the use of neosalvarsan is indicated but, in the description of the actual treatment, salvarsan is stated to have been chiefly used.]

A. P.

RAGAZZI (Carlo). **Un caso di spirochetosi bronchiale (Castellani 1906).**—*Pathologica.* 1916. Jan. 1. Vol. 8. No. 172. pp. 1–4.

This paper gives a short historical resumé of some of the literature relating to *Spirochaeta bronchialis*, concerning which organism a long, illustrated paper by FANTHAM recently appeared [see this *Bulletin*, Vol. 6, p. 211]. Reference is also made to MACFIE's findings on the Gold Coast. The present author's observations are restricted to a single case, that of a Bedouin of Cyrenaica, who was in the hospital of the civil prison at Bengazi. The patient was observed for 45 days. Spirochaetes were found in the sputum of the man. They were mostly 7μ to 8μ long, others being 10μ to 11μ, and some up to 12μ or 13μ. Multiplication of the spirochaete by longitudinal division was observed in life, and apparently multiple transverse fission into 7 to 10 elements was seen. Note is made of the general climatic conditions of Bengasi, where the patient was under observation.

A. P.

TORO VILLA (G.). **Espiroquetosis broncopulmonar.**—*Repert. de Med. y Cirugia.* 1916. Mar. Vol. 7. No. 6. [No. 78.] pp. 250–256. With 1 fig.

The patient in whom bronchial spirochaetosis was studied was a native of Angostura, Colombia, South America. His sputum was muco-purulent, adherent to the vessel, and streaked with blood. Pneumococci were absent. An enormous number of spirochaetes was present in the sputum. They were not of oral origin, as the buccal cavity was thoroughly disinfected before the sputum was examined. The patient received daily injections of 0·3 grammes of neosalvarsan and took an expectorant. The spirochaetes gradually disappeared, and the patient improved in about a month. Acute and chronic cases

of bronchial spirochaetosis have been observed. The acute cases were cured under treatment or reverted to the chronic form. Microscopical examination of sputum is necessary to determine the cause of the disease. The prognosis is good.

A large part of the paper consists of copious quotations of the work of others, principally CASTELLANI and CHALMERS, CHALMERS and O'FARRELL, MACFIE, and LURIE, whose work was confirmatory of that of FANTHAM [see this *Bulletin*, Vol. 3, p. 6; Vol. 6, p. 211; Vol. 7, p. 121]. Apparently the work of the last mentioned author is unknown to the writer in the original.

A. P.

FANTHAM (H. B.). **Observations on** *Spirochaeta eurygyrata*, **as found in Human Faeces.**—*Brit. Med. Jl.* 1916. June 10. pp. 815–816. With 1 fig.

Spirochaetes were found by the author in the faeces of soldier patients who had contracted various forms of dysentry or diarrhoea in Gallipoli or Flanders. The organisms were also seen in the stools of a few normal persons. The spirochaetes were found during the routine examination of stools in 1915–16, and although only a few minutes could often be devoted to the examination of a fresh preparation, yet 23 cases of single infection with spirochaetes were detected by this means alone in three months. The use of dark-ground illumination or of stained smears of stools revealed many more spirochaete infections, even as high as 50 per cent. of the cases examined.

The movements of the spirochaetes are described by the author. The motion "may be divided into two components—an undulatory flexion of the body mainly for progression, and a corkscrew or helicoid movement of the body as a whole due to its coiling. The number of waves along the body of a spirochaete varies according to the rate of progression of the organism, and is an index of its rate of motion, being also slightly influenced by its thickness." The body of a rapidly moving form is thrown into many small waves, while slowly moving organisms are thrown into fewer larger waves. Various other movements are recorded. Agglomeration of the parasites is common, the tangles produced being more frequent in fluid stools. When shed epithelial cells from the intestinal wall have been present, spirochaetes have been seen to penetrate them, become quiescent there or even produce resting coccoid bodies; sometimes they were observed to emerge again from the cells.

The morphology of the spirochaetes, *S. eurygyrata*, is described. The length varies from 3μ to 15μ, and the breadth is about $0{\cdot}25\mu$. The ends are usually tapering, but vary according to the stage of growth or recentness of division, which is by binary fission. The number of curves or waves seen along the body may vary from two to nine, and is not specific. In well-stained specimens chromatin granules can be seen along the body.

The number of spirochaetes in the stools varies from day to day. The more fluid the stool, the greater is the number of spirochaetes present, as a rule. "During the period when the spirochaetes as such are absent from the stools, it is probable that they have produced granules or coccoid bodies." In the author's opinion "granules

cannot be considered, at present, to be definitely of spirochaetal origin unless their formation from and subsequent elongation and development into spirochaetes have been observed in the living organisms."

The earlier observations, mostly vague, are analysed. These were chiefly made during the years 1884–86 and 1893–94, especially regarding the occurrence of "spirilla" in cholera motions. The *Spirillum hachaizae* of KOWALSKI, of which illustrations and dimensions are lacking, is considered to be too insufficiently defined for the name to be valid. The work of Le DANTEC (1903) on spirochaetal dysentery is noted. The *Spirochaeta eurygyrata* and *S. stenogyrata* of WERNER (1909) are considered to be merely varieties of a single organism. The author amends the *S. eurygyrata* of Werner thus: The organism "has tapering ends, measures up to 15μ long, and is about 0·25μ broad. It contains a diffuse nucleus, consisting of chromatinic granules. The number of coils or waves is variable, depending on the rate of movement and thickness of the organism."

The author's conclusions are:—

"*Spirochaeta eurygyrata*, Werner emend. Fantham, may occur in the stools of dysenteric and apparently healthy persons. The organism, which has pointed ends, measures from 3μ to 15μ in length by about 0.25μ in breadth.

"The so-called spirilla, mentioned by some of the earlier workers as occurring occasionally in cholera motions, are included under the name of *Spirochaeta eurygyrata*.

"The number of coils in a spirochaete is not a specific character but is variable, and is primarily an index of its rate of motion, being also partly dependent on the thickness of the organism."

A. P.

FANTHAM (H. B.). **Spirochaetes and their Granule Phase.**—*Brit. Med. Jl.* 1916. Mar. 18. pp. 409–411.

This paper contains a concentrated account of the granule phase in the life-histories of various members of the Spirochaetacea, more particularly those that affect man. The distribution of spirochaetes in nature and their morphology are briefly described. It is remarked that the number of coils or undulations of a spirochaete is not a specific character, but is rather an index of the rate of motion of the organism, as well as of its thickness. Polymorphism due to the processes of growth and division is usual. Chromatin granules occur along the body. Spirochaetes of vertebrates are transmitted by the direct contaminative method, as in yaws, or by the intermediation of an arthropod vector (as in tick or relapsing fever).

In connection with the granule phase in the life-cycle of spirochaetes, "there is no doubt that spirochaetes produce such granules; it is only their significance, whether cyclical or degenerative, that is in question." The author presents the evidence in respect to both of these opinions. The formation of granules or coccoid bodies in living spirochaetes is described. The cytoplasm concentrates around the minute, refractile chromatin masses. Each small concentration becomes oval, the outer layer differentiates as a thin coat, and ultimately a series of coccoid bodies is produced. These are released by one or more ruptures in, or disintegration of, the periplast of the parent. "The progressive elongation of the granules, the assumption of the

sinuous form, and the emergence of very small spirochaetes from the groups of granules have been observed in life. It is very probable that there is a definite period in the life of a spirochaete at which there is a marked differentiation of coccoid bodies. It must also be borne in mind that coccoid bodies may be present when spirochaetes as such cannot be detected." Nevertheless, the finding of chromatinic granules alone is not sufficient to justify the inference that spirochaetosis is indicated, as all such granules are not necessarily spirochaetal in origin.

Some workers have considered granules to be degenerative or to be unconnected with spirochaetes. In some cases, an invisible phase, that yet is said to retain the spirochaetal facies, has been postulated. In other cases, it has been alleged that the granules found in ticks transmitting spirochaetes were natural to the tick and had been mistaken for spirochaetal granules. But "it has not been denied that granules may occur in normal tick cells, nor was it asserted that all the intracellular granules in infected ticks were spirochaetal in origin, for the granules seen in arachnid cells are not all of the same nature."

Attention is drawn to the work of Sergent and Foley (1914) on the development of *S. recurrentis* or varieties thereof in *Pediculus vestimenti*. The spirochaete there assumes a very small form which is as virulent as the spirochaetiform stage. Nicolle and Blanc (1914) also found that the causal agents of relapsing fever are virulent or infective in the louse just before they reappear as spirochaetes.

Granule stages in spirochaetes in the blood of vertebrates have been recorded from time to time. The work of Balfour, Prowazek, Breinl, Fantham, and Sergent and Foley is quoted. The latter workers found that a minute but infective form occurred in the blood of patients suffering from relapsing fever during apyretic intervals when spirochaetes were absent. Obermeier and von Jaksch have observed similar bodies and the development of typical spirochaetes therefrom. The work of Fantham (1914–1915) has shown that the coccoid bodies are the means whereby *Spirochaeta bronchialis* is spread from man to man. The historical interest attaching to *Cytoryctes luis* of Siegel is noted, these bodies being in all probability granules or coccoid bodies shed by *Treponema pallidum*.

Finally, some effective evidence for the transition and growth of granules or coccoid bodies into spirochaetiform organisms has been afforded recently by the work of Noguchi, Balfour and Leishman. The last-mentioned worker has seen the definite extrusion of small actively motile spirochaetes from granule clumps. The value of the recognition of the granule phase in the Spirochaetacea as stated by Noguchi is also quoted. It was the recognition of granules in pure cultures of *Treponema pallidum* that led this well known worker to investigate the brains of general paralytics and spinal cords from cases of tabes dorsalis, whereby the discovery of *T. pallidum* in such cases was brought about and with it the possibilities of more effective treatment.

A. P.

NOGUCHI (Hideyo). **Certain Alterations in Biological Properties of Spirochaetes through Artificial Cultivation.**—*Ann. Inst. Pasteur.* 1916. Jan. Vol. 30. No. 1. pp. 1–4.

The author points out that certain cultures formerly considered to be those of *Treponema pallidum* differed from those of the true organism in being putrefactive and avirulent. It is now certain that an odour-producing Treponema is not *T. pallidum.* The main portion of the paper consists of an account of certain modifications occurring in the biological properties of certain treponemes after they have been cultivated for a shorter or longer time on artificial media. The various species have been under observation in cultures for two to four years (since 1910–1912).

"From a morphological standpoint no striking modifications have been observed in these cultures. They still retain their original types. . . . The staining reactions are also unaffected, although the *pallidum*, when grown in a fluid medium, takes up the red component of the Giemsa somewhat more readily than the specimens in the tissue or solid culture media. On the other hand it has been noticed that certain definite alterations occur in their biological properties. In the case of the *pallidum* the virulence disappeared within about four months after its purification. In that of the *pertenue* it was found that the strain I studied lost its virulence as soon as it was freshly isolated in pure culture. The power possessed by the *microdentium* to produce an intense disagreeable odor remained undiminished for nearly one year, but this gradually and almost imperceptibly diminished in intensity and now after two years the odor is scarcely noticeable. In the case of the *mucosum* it was found that its mucin-producing property gradually weakened and finally disappeared within about five months after its isolation. Although the odor-producing property of this species has suffered a more gradual diminution in the course of a prolonged life in culture, nevertheless it is distinctly less marked than was the case two years ago. The other species here mentioned [*macrodentium, calligyrum* and *refringens*] possess no remarkable features, and they apparently remain unmodified in their characteristics, none of them being odor-producing."

T. pallidum and *T. pertenue* are parasitic organisms as contrasted with *T. microdentium* and *T. mucosum* which are considered to be saprophytic, yet all of them undergo alterations of their biological characters in cultures.

A. P.

WELTMANN (Oskar). **Die "Vitalfärbung" zum raschen Nachweis der Spirochaete Obermeieri.** [Intra Vitam Staining for Rapid Demonstration of *S. recurrentis.*]—*Wien. Klin. Woch.* 1915. Nov. 18. Vol. 28. No. 46. p. 1257.

The author gives a short account of various methods for staining *Spirochaeta recurrentis* (*obermeieri*) intra vitam, some of such methods being well-known. He mentions LEPORSKY's method, by the use of a mixture of brilliant-cresyl-blue and Sudan III, and his own method. This consists in preparing a thin film of methylene blue or fuchsine-methylene blue on a coverslip, which is then dried over a flame, and the material containing the spirochaetes is spread on the dry coverslip so prepared. [This method is an old one.] A solution of gentian violet in absolute alcohol, used in a similar manner, is recommended for staining the spirochaetes of the mouth.

A. P.

LLOYD (Ll.). **On the Association of Warthog and the Nkufu Tick** (*Ornithodorus moubata*).—*Ann. Trop. Med. & Parasit.* 1915. Dec. 30. Vol. 9. No. 4. pp. 559–560.

The author records the presence of *Ornithodorus moubata* in the burrow of a warthog. A native examining the burrow in the Luangwa valley, Northern Rhodesia, was attacked by these ticks, most of which were very young larvae that had not previously fed. The ticks were found during a search for the pupae of *Glossina morsitans*. It is suggested that the warthog may act as a distributing agent for *Ornithodorus moubata*.

A. P.

YAKIMOFF (W. L.), SCHOKHOR (N. J.) & KOSELKINE (P. M.). **Spirochétose des poules au Turkestan russe.**—*Bull. Soc. Path. Exot.* 1916. Apr. Vol. 9. No. 4. pp. 227–228.

The presence of spirochaetosis in fowls at Taschkent and Termese on the Afghan-Russian frontier was discovered by the present authors in 1913. In July of that year, an epidemic occurred in Taschkent. The adult birds succumbed first, then the chicks were attacked. Out of blood smears from 45 birds, four fowls and four chicks were found infected with spirochaetes. In a second outbreak, two fowls and nine chicks out of 50 birds examined contained spirochaetes in their blood. In an outbreak at Orenbourg among fowls and turkeys, five out of 45 fowls contained blood spirochaetes and five turkeys were also found to be infected. On two other occasions, a cock and two hens, respectively, had numerous spirochaetes in their blood.

At Termese, an epizootic among fowls occurred. Spirochaetosis was suspected, but the birds' blood could not be examined. However, *Argas persicus* collected from farmyards and put on clean birds, have resulted in the production of spirochaetosis. The usual symptoms and post-mortem appearances were shown by the birds at autopsy.

Injections of atoxyl in the pectoral muscles have been successful, the dose being 0·06 to 0·1 gm. for adults, and 0·03 to 0·05 gm. for chicks.

A. P.

WEIL'S DISEASE.

INADA (Ryokichi), IDO (Yutaka), HOKI (Rokuro), KANEKO (Renjiro) & ITO (Hiroshi). **The Etiology, Mode of Infection, and Specific Therapy of Weil's Disease (Spirochaetosis Icterohaemorrhagica).**—*Jl. Experim. Med.* 1916. Mar. Vol. 23. No. 3. pp. 377–402. With 7 plates.

Weil's disease or febrile jaundice is epidemic and endemic in Western Japan. The present authors believe that the spirochaete discovered by them in 1914 and named *Spirochaeta icterohaemorrhagiae* in January 1915 is the pathogenic agent of Weil's disease. The malady is now re-named spirochaetosis icterohaemorrhagica. The symptoms of Weil's disease in Europe and Japan "are similar but there are some variations." *Spirochaeta icterohaemorrhagiae* is present in the blood only during the early stages of the disease and occurs only in small numbers. At autopsy, the liver may contain no spirochaetes or they

may be few or not easily recognised. When the organisms are inoculated to guinea-pigs, they multiply freely and are then more easily detected.

Thirteen out of seventeen guinea-pigs inoculated intraperitoneally with *Spirochaeta icterohaemorrhagiae* gave positive results. The blood of all of the patients on the fourth to fifth day of illness gave positive results; blood from the seventh day was once positive, once negative, once from the ninth day the blood was positive, but none of the three cases tested on the twelfth day gave positive results. Blood must be injected into animals within the first seven days of illness to give positive results. Usually the incubation period is seven to eight days. The passage from guinea-pig to guinea-pig is possible, fifty-one passages having been accomplished by July, 1915. Intraperitoneal, subcutaneous, or oral injection of 2 cc. of heartblood or liver emulsion gave successful results. The animals succumb in five to eight days after intraperitoneal inoculation, in nine to ten days after inoculation through the uninjured skin or the alimentary tract, and in seven to eight days after inoculation through the injured skin. The symptoms in the guinea-pig are like those in man. Rabbits fail to become infected. Some mice and white rats developed jaundice and slight haemorrhage and succumbed, though spirochaetes were not found in them.

The pathological changes in guinea-pigs are described. There is marked general jaundice, with haemorrhages into various parts of the body and parenchymatous changes of the organs. The liver shows cloudy swellings of the parenchyma, the kidneys acute parenchymatous nephritis. "The lungs present small and large hemorrhagic spots, like the wing of a mottled butterfly. This change is one of the most important in the diagnosis of the disease."

The spirochaete is present in the blood and in various organs. It is often seen in epithelial cells. It is most abundant in the liver, where it is common in the intercellular spaces. The adrenal gland and the kidneys are the next most heavily infected organs. Spirochaetes are few in the spleen, bone-marrow and lymphatics.

Spirochaeta icterohaemorrhagiae most commonly are 6μ to 9μ long, the greatest reaching 12μ to 13μ. In the liver short forms measure 4μ to 5μ, but the common forms are longer and measure 8μ to 9μ. The longest individuals average 20μ, though one measuring 25μ has been seen. The thickness is about $0{\cdot}25\mu$. Two or three large or four or five smaller waves are present in the body. Under dark-ground illumination some of the spirochaetes show a granular appearance, and granules are present in stained specimens. "According to the length of the spirochaeta the refractive granules number 25 to 30 to 40." The movements of the organisms are shortly described.

Variable results were obtained when the filterability was tested with different filters. Cultures using Noguchi's methods were successful. The mode of infection in nature has not been absolutely proved, but by experiments with guinea-pigs, it has been found that the spirochaete is "able to penetrate through a macroscopically healthy skin and cause the disease." Only a few cases in the authors' clinic indicated cutaneous origin, but a number of suggestions supporting the hypothesis are given.

By examination of the urines of patients and inoculating them to guinea-pigs, it has been found that the spirochaetes are voided with the urine, numerous spirochaetes being present in it about the 13th to 15th day of the illness. One out of ten guinea-pigs inoculated with faeces of patients gave a positive result. The spirochaetes are "excreted in the urine, feces and bile in the experimental disease of the guinea-pig up to the time of death."

An immune body appears during the course of Weil's disease in man, and probably "destroys and dissolves the spirochaetae." The immune body does not seem to be produced in the guinea-pig, and consequently the number of spirochaetes in the guinea-pig is greater than it is in man.

Prophylactic measures are recommended. The disease is frequent among coal miners who work in parts of mines where pumping is necessary. The removal of the water and the disinfection of the ground are necessary. The urine of a patient must be disinfected for at least forty days, since spirochaetes are voided in it for that time. Stools and bloody sputum also should be disinfected.

Treatment with salvarsan usually poisoned the guinea-pig, whose resistance to arsenic is low. Serum reactions gave more promising results. Eleven out of twelve animals inoculated with immune goat serum, before jaundice had appeared, had the spirochaetes disappear from the blood in half an hour after the injection, and all the animals remained alive. The injection of immune goat serum was ineffective after jaundice had appeared. The serum treatment is not suitable for cases of relapse. A partial success has also been obtained with immune horse serum.

Five plates of microphotographs and two of drawings illustrate the article.

A. P.

Ito (Tetsuta) & Matsuzaki (Haruichiro). **The Pure Cultivation of** *Spirochaeta icterohaemorrhagiae* **(Inada).** — *Jl. Experim. Med.* 1916. Apr. Vol. 23. No. 4. pp. 557–562. With 2 plates.

The spirochaetes for cultivation were obtained from the heart blood of subinoculated guinea-pigs, the samples of blood being examined under dark-ground illumination. The samples may be used at once or after being kept in a sterile test-tube for several days at room temperature.

Blood agar and blood gelatine were found to be the most satisfactory media of a semi-solid or solid character. Blood gelatine is preferable. The media are inoculated with a drop of infected blood before they become solidified. A layer of paraffin may be added to the surface of the medium in the culture tubes, which are kept at temperatures between 15° C. and 37° C., the optimum being between 20° C. and 25° C. The cultures should be left undisturbed for 10 to 14 days. A growth appears usually in about a week, and the maximum is reached in two to three weeks. There is no odour, no production of gas and no liquefaction of the media.

The morphology and movements of the cultural spirochaetes are briefly described. Their length is said to vary from a "quarter of the diameter of an erythrocyte" to "five times as long." The mode of division was undetermined.

Fluid media may be used for culture. "Blood serum of man or ox diluted with an equal part of distilled water or undiluted ascitic fluid or pleural exudate is sterilized by subjecting it to a temperature of 50° to 60° C. for half an hour for several successive days." Noguchi's medium may also be used. The tubes are incubated at temperatures varying from 15° to 37° C. Growth is first noticed after three to ten days. The authors state that "a pleural exudate rich in fibrin seems to be the most suitable fluid medium for the purpose of cultivating this organism." Small quantities of cultures, inoculated intraperitoneally to guinea-pigs, are pathogenic. The spirochaetes have been recovered from such animals and pure cultures obtained, thus showing that *S. icterohaemorrhagiae* is the causal agent of Weil's disease.

The authors' conclusions are as follows :—

"Pure cultures of the spirochaetal causative agent of the disease known as Weil's disease, or febrile icterus, in Japan, have been obtained by us in a solid, a semi-solid, and a fluid medium. The spirochaeta thus isolated remains pathogenic for guinea-pigs for many generations. Up to the present time we have succeeded through the courtesy of Professor Nagayo, Dr. Konuma, and Dr. Ishihara, in cultivating three different strains.

"The spirochaeta is a facultative anaerobe.

"The solid and semi-solid culture media possess one disadvantage, in that they are opaque on account of the addition of red blood corpuscles, but it is hoped that this drawback may soon be overcome by further studies. We shall report later the results of investigations regarding various questions in immunity as well as further details regarding the biological properties of the spirochaeta."

A. P.

UHLENHUTH & FROMME. **Zur Aetiologie der sog. Weil'schen Krankheit (ansteckende Gelbsucht).**—[The Etiology of Weil's Disease (Infectious Jaundice).] *Berlin. Klin. Woch.* 1916. Mar. 13. Vol. 53. No. 11. pp. 269–273. With 4 figs.

The authors give an account of the symptoms of Weil's disease in man and in subinoculated animals. They found that defibrinated blood at cool summer temperature remained infectious for seven days. The urine of infected men and animals was also infectious. When healthy guinea-pigs were put with infected ones they also became infected, but the exact mode of such infection was not determined. Neosalvarsan, colloidal silver, collargol, colloidal antimony, mercury atoxyl, silver atoxyl, atoxyl, and optochin (MORGENROTH) had no therapeutical effect, apparently when tested on guinea-pigs. It was found that the serum of convalescents contained protective substances, which were also present in the serum of rabbits, sheep and asses.

Certain points of practical importance were noted. Icterus is considered to be the cardinal symptom. The spirochaetes are present in the blood of the patient only on the first day of illness, but appear in greater numbers in subinoculated guinea-pigs. Human urine can also be used for inoculation of animals. A positive result is usual in five days. If the animal is negative for 14 days, the patient can be considered negative for Weil's disease.

Contact seems to be the chief mode of infection. Indirect infection by insects is also possible.

The four microphotographs, illustrating the paper, show spirochaetes in smears or sections of the livers of infected guinea-pigs. A. P.

GOEBEL. **Beitrage zur Frage der sogenannenten Weilschen Krankheit (ansteckende Gelbsucht).**—*Med. Klinik.* 1916. Apr. 9. Vol. 12. No. 15. pp. 381–383.

The author gives a description of the clinical symptoms of two cases of Weil's disease, and remarks on the importance of early inoculation experiments of infected human blood to guinea-pigs. His main conclusions may be summarised as follows: In all doubtful cases of Weil's disease the following procedure of diagnosis by animal experiments should be made. Inoculation of defibrinated blood to guinea-pigs should be performed at the commencement of the illness, and the convalescent serum should be titrated. It was observed that the guinea-pig virus was infective to man. Also, when blood from men suffering from Weil's disease without icterus was inoculated to guinea-pigs, the latter showed spirochaetosis with icterus.

The injured skin of the hands probably serves to admit the virus. The spirochaetes may also enter the body by way of unbroken skin (nail grooves ?) or by the mucous membrane of the eyes. Observations on cases of spontaneous infection show that transmission by insects or per os are also possible. As with *Spirochaeta recurrentis*, great care must be taken in laboratory work with Weil's disease, and rubber gloves should be used.

A. P.

TYPHUS.

Low (R. Bruce). **The Epidemiology of Typhus exanthematicus in Recent Years.**—*Forty-Fourth Ann. Rep. of the Local Govt. Board.* 1914–1915. Supplement containing the Report of the Medical Officer. 1916. London. pp. 28–89.

This account of the epidemiology of typhus was prepared as there were signs of typhus becoming epidemic in central Europe, as a result of abnormal conditions due to the war, and as in certain war areas, notably Poland and Galicia, typhus is endemic. The means whereby the transmission of typhus by lice were fully established are set forth. Preventive measures must be directed against lice ; other biting insects may aid in transmission. It is possible that " droplet infection, as in pneumonic plague," may also occur. History shows that typhus occurs under conditions of overcrowding and filth, and it is an " almost invariable accompaniment of protracted military campaigns," where facilities for personal cleanliness for soldiers are scarce, and infestation with lice occurs. The Napoleonic, Crimean, Russo-Turkish and recent Balkan wars have all been accompanied by typhus. In 1915 typhus appeared in Germany among Russian prisoners of war. It also occurred in Austria, and became epidemic among the Turkish troops in the Erzeroum district. The possibilities of outbreaks of typhus on the Western front, owing to the importation of native troops from endemic centres in North Africa, are indicated. In the Western hemisphere, Mexico is the chief focus of typhus. Ireland still remains an endemic centre. In England and Wales during the period 1869–1883 there were 23,702 deaths from typhus, during 1884–1898 there were 2,249, while during 1899–1913 there were only 390. The disease still lingers in the northern counties of England.

An interesting survey of the various epidemics of typhus which have occurred during the last century in the different countries of Europe, Asia, North Africa and America is given.

A. Porter.

Caldwell (Bert. W.). **The Epidemic of Typhus Exanthematicus in the Balkans and in the Prison Camps of Europe.**—*Jl. Amer. Med. Assoc.* 1916. Jan. 29. Vol. 66. No. 5. pp. 326–331.

This very well written paper deals with the conditions that led to such great mortality in the Serbian epidemic of typhus from December 1914 to July, 1915, and with its relative prevention in the various prison camps that the author saw. The spread of the epidemic from the Danube to the Greek frontier is considered to have been due to preventible causes, to indifference on the part of the civil and military authorities, and to great carelessness. No reliable statistics as to the number of persons infected are available, the military returns not including the civil population, while in many cases death occurred before diagnosis or without medical attention. The author estimates that about one-fifth of the population of two and a half millions was attacked by typhus, and 135,000 (including 30,000 Austrian prisoners) died of the disease. The hospital mortality ranged from 19 to 65 per cent. The opinion of the author is that typhus is solely transmitted " through the bite of an infected louse."

The incubation period is about 14 days. "Eruption follows the onset closely, and reaches its maximum intensity on the fifth day. It is during this five-day eruptive period that the presence of the infected louse becomes dangerous to the non-immune; after this period of the disease and during the convalescence, there is little or no danger of the louse becoming infected after feeding on the patient."

It was noted that more men were infected than women and that children were seldom attacked. "Only where the conditions for hygienic living were provided did the Serbian people escape. All classes and professions were affected." Sporadic cases from the north of Serbia served as foci of infection. The distribution of Austrian prisoners, who were vermin-infested, spread the disease to central and southern Serbia. The unwise scattering of typhus patients also disseminated the malady and made the epidemic uncontrollable.

For the purpose of coping with the epidemic, the country was divided into four sections. The northern and eastern districts were assigned to the French and Russians respectively, the central area was assigned to the English, and the southern to the American Red Cross Sanitary Commission. The last named area included the towns of Uskub, Veles, Prizien, Pristina and Monastir. In each area general sanitation and hygiene were insisted upon, and conditions rapidly improved. On each of the frontiers energetic measures were taken to prevent the spread of the disease into the surrounding countries.

The author considers that the measures taken for the prevention of typhus among prisoners in central Europe were satisfactory. The use of quarantine, the thorough disinfection of clothes and the eradication of lice served to prevent epidemics.

Other diseases communicated by flies and other insects in Serbia are noted. Among such are malaria, typhoid, relapsing fever and pappataci fever.

The treatment of typhus is unsatisfactory. The use of the serum prepared by Nicolle or the Plotz vaccine tends to cause an abortion of the disease. It is noted that with one exception, out of two to three hundred persons inoculated with the Plotz vaccine, all of whom spent some time in the typhus areas, no case of infection occurred.

A. P.

Mueller (O.). **Ueber Fleckfieber.**—*Med. Klinik.* 1915. Nov. 7. Vol. 11. No. 45. pp. 1230–1233; Nov. 14. No. 46. pp. 1261–1264. With 4 text-figs; Nov. 21. No. 47. pp. 1285–1287.

This paper gives an account of the author's experience of typhus epidemics in prison camps in North Germany. The mortality varied with the age of the patients, the younger men being more resistant than older ones. Remarks are made on the means adopted by different workers for combating outbreaks. The use of mixtures containing various sulphur compounds, of naphthalene-vaseline, eucalyptus, fennel oil, aniseed oil, bergamot, rape oil, and of xylol and tobacco water as preventives are discussed. They may be somewhat efficacious against lice, but are of little use against nits. Louse transmission is considered the most common means of spreading typhus. The author thinks that typhus is probably only a septic variety of typhoid.

A discussion of the pathological anatomy, clinical manifestations with complications such as symmetrical gangrene of the feet, and a

number of variations of the temperature curves observed, is given. The prognosis varies with the condition of nourishment, nature of the disease, general constitution and age of the patient. A differential diagnosis of typhus from paratyphoid A and B, typhoid, measles and small-pox is given, and notes on the treatment adopted by the author and previous workers are set forth. [There does not appear to be anything new in these differential diagnoses and treatments.]

A. P.

SPAET (Wilhelm). **Zur Frage des Flecktyphus auf dem galizischen Kriegsschauplatze.** [Typhus in the Galician Battle-Field.]—*Wien. Klin. Woch.* 1915. Dec. 9. No. 49. pp. 1348–1351.

The author has investigated an outbreak of typhus among the civil population in a small endemic centre in Galicia. Out of 55 cases observed, 44 gave a positive Widal reaction. The epidemic, though described as typhus, is therefore considered really to be one of typhoid, and it is suggested that many other cases termed typhus have really been typhoid. The author largely bases his conclusions on the hypothesis that the Widal reaction is absolute and is invariably reliable. He states that clinically no one symptom is absolutely restricted to typhus or typhoid and is entirely absent from the other malady. Abnormal temperature curves may be obtained in each case. He concludes that such outbreaks must be overcome on a large scale by the methods appropriate for typhoid, that is, by adequate disinfection of excreta, rather than by measures for the removal of lice.

A. P.

DELÉARDE & D'HALLUIN. **A propos d'une épidémie de typhus exanthématique observée en Allemagne (d'avril à juin 1915).**—*Bull. et Mém. Soc. Méd. des Hôpit. de Paris.* 1916. Mar. 23. 3 ser. 32 Ann. pp. 320–328.

The authors, when prisoners of war in Germany, were able to aid in combating an epidemic of typhus at the prison camp at Langensalza in Saxony and in another at Niederzwehren near Cassel in the Grand Duchy of Hesse. The epidemic commenced after Russian prisoners were mixed with the French. It began in January 1915, and spread till May at Langensalza and till July at Niederzwehren. In April and May there were 5,000 men ill simultaneously at the latter camp. Conditions at this camp were very harsh. No isolation measures were taken until May, and many deaths occurred. Lice undoubtedly spread the disease, but in some cases droplets of saliva expelled in coughing were infectious, and when inoculated to the mucosa produced the disease. The appalling conditions prevailing at the camps are set forth in detail.

It was found that the incubation period varied according to the mode of infection, the number of louse bites, the virulence of the causal agent and the state of receptivity of the person inoculated.

A detailed account is given of the various symptoms observed, and of the complications, a new one being noted—arteritis, which passes easily into dry gangrene. The other complications are well known. It is mentioned that for 15 days after the cure of typhus, spots or marks can be found here and there on the body.

A. P.

NEUKIRCH (P.) & ZLOCISTI (Th.). **Epidemiologische und klinische Erfahrungen bei Fleckfieber in Ostanatolien.** [Typhus in East Anatolia.]—*Med. Klinik.* 1916. Mar. 5. Vol. 12. No. 10. pp. 256–259.

The authors give an account of an epidemic of typhus observed in East Anatolia. The long discussion of the clinical manifestations and of temperature curves covers the same ground as that of most other workers and contains nothing new. The belief is expressed that typhus is really a malady of the brain, and that prognosis depends largely on the condition of the brain, especially of the medulla oblongata. Notes on various complications are briefly given. The main transmitting agent of typhus is considered to be the louse, but the flea and the bug cannot be entirely excluded as they were exceedingly abundant in the typhus hospitals.

A. P.

SALAZAR (Manuel Martin). **Profilaxis del Tifus exantematico.**—*Siglo Med.* 1916. Mar. 11. Vol. 63. No. 3248. pp. 161–163; Mar. 18. No. 3249. pp. 177–179; Mar. 25. No. 3250. pp. 194–196; Apr. 1. No. 3251. pp. 209–213; Apr. 8. No. 3252. pp. 225–229.

This interesting general account of typhus by Dr. Salazar, who is Director-General of Exterior Sanitation in Madrid, is worthy of being read in the original by those interested in the subject. The main outlines of the articles only can be mentioned here. The first part of the work consists of a general history of outbreaks of war-diseases, especially of typhus and cholera. Epidemics were formerly thought to be spread by gipsies, beggars, pilgrims and other wanderers, but were spread in reality by their ectoparasites. With regard to typhus, Dr. C. M. CORTEZO, at the International Sanitary Conference at Paris in 1903, set forward the hypothesis of typhus being lice-borne (see p. 343 of the Abstracts of the Proceedings of the Conference), based on his experiences of an epidemic in Madrid. The work of NICOLLE, CONSEIL, RICKETTS, and others came later. It is stated that CORTEZO told his ideas also to ROUX, the Director of the Institut Pasteur of Paris, at whose instigation, it is claimed, NICOLLE and CONSEIL undertook work at Tunis, their first report appearing in 1909.

A good account is given of the characters of typhus epidemics and of the predisposing causes. The views as to a protozoal excitant, a bacterial one and a filterable virus are also discussed. The work of RABINOWITCH, of NICOLLE and CONSEIL in Tunis, of CORTES in Mexico, of RICKETTS and WILDER, ANDERSON and GOLDBERGER in America, and of HORT and INGRAM at the Lister Institute, London, who worked on material from the epidemic in Belfast in 1914, are all treated at length. The organism found resembled that of RABINOWITCH, WILSON and PLOTZ, and was very small, $0{\cdot}2\mu$ to $0{\cdot}6\mu$, and was filterable. The excitant of typhus is probably a very polymorphic micro-organism.

With regard to the mode of transmission, both the body louse and the head louse are incriminated. Inoculation may take place by the bite of the insect or by the crushing of the insect on the skin. Experimental work with insects other than lice so far has been negative. Prophylaxis, therefore, must be directed against lice infesting the

person, the ingress of lice-infested persons into typhus areas must be prevented, and typhus cases must be segregated. There is need for increased attention to sanitary procedures in Spain, and general warnings as to anti-typhus measures, disinfection of clothing, the use of preparations such as ointments against lice, are given. There are also short accounts of the diagnosis of typhus, and of its differential diagnosis, and a summary of general hygienic measures recommended concludes the paper.

A. P.

ANCONA (Giacomo). **Sulla diagnosi differenziale fra tifo addominale e tifo esantematico.**—*Riv. Crit. Clin. Med.* 1916. Mar. 4. Vol. 17. No. 10. pp. 149–154. With 1 chart.

The author wishes to draw attention to atypical cases of typhoid, which may prove to be typhus. He gives a detailed account of a soldier patient, aged 23, admitted to an Italian field hospital, and considered to be suffering from typhoid. The man had been inoculated against typhoid and cholera. Five days after admission to hospital, Widal's reaction was positive. A rash developed, the spots disappeared on pressure and were non-haemorrhagic. Delirious periods occurred. The patient died on the eleventh day. At post-mortem, the lesions associated with typhus were found. The author remarks on the great difficulty of differentiating between some forms of typhus and typhoid, especially as Widal's reaction may persist for a long time after preventive inoculation. The early symptoms of both diseases may be similar. The violent mental disturbances, increase in the volume of the spleen, rapidity of appearance and distribution of the rash are not absolute criteria for differentiation, though helpful. The abdominal symptoms and sharp changes in the temperature curves need attention. A knowledge of the epidemiology of typhus is of use at times in reaching a correct diagnosis.

A. P.

POINDECKER (Hans). **Zur Diagnose des Fleckfiebers im Felde.**—*München. Med. Woch.* 1916. Feb. 1. Vol. 63. No. 5. pp. 176–177. With 3 figs.

In order to diagnose typhus, use is made of the results of the histological examination of a small portion of the rash. The piece of skin is removed and embedded, sections being stained with haemalum and carbol fuchsin. In typhoid the vessels of the corium, especially of the papillary bodies, show perivascular infiltration with lymphocytes. Necrosis of the walls of the bloodvessels is not seen. The roseola of typhus, however, show a clear necrosis of the vessel walls, more especially of the precapillaries and the smaller arteries of the papillae. Granular and hyaline thrombi may be present. Perivascular infiltration occurs. The greater part of the infiltration elements consists of large cells, not unlike epithelia, possessing large, pale longish nuclei. Other nuclear bodies may lie in the granular stroma. Photographs of sections illustrating the above points are given.

A. P.

WEIL (E.) & FELIX (A.). **Zur serologischen Diagnose des Fleckfiebers.** —*Wien. Klin. Woch.* 1916. Jan. 13. Vol. 29. No. 2. pp. 33–35.

The results described by the author were based on examinations of cases of typhus from Eastern Galicia. Paratyphoid, typhoid and some dysentery cases were also examined. In the case of typhus, a constant relation between the specific agglutination and the Widal reaction could not be established. In experiments made with control sera, 12 per cent. of 169 cases investigated gave normal agglutination. A bacillus was found in an acute case, and possibly might be the excitant of typhus. It was very difficult to find. If this organism is the causal agent, a further aid in the diagnosis of typhus will be afforded.

A. P.

HABETIN (Paul). **Zur Differentialdiagnose zwischen Typhus exanthematicus und abdominalis.**—*Wien. Klin. Woch.* 1916. Jan. 13. Vol. 29. No. 2. pp. 35–37. With 3 curves.

A discussion of the chief differences between typhus and typhoid fever is presented by the author. According to his observations, the temperature curve of typhus is characteristic, being almost geometrically congruent, with a definite, spontaneous, critical fall, which does not occur in typhoid. Serological tests are valuable indications of typhoid. However, it is pointed out that mixed infections may occur, as well as atypical ones, for which no definite rules can be made.

A. P.

JOB (E.) & BALLET (B.). **Les complications nerveuses du Typhus exanthématique.**—*Bull. et Mém. Soc. Méd. des Hôpit. de Paris.* 1915. Dec. 30. 3 ser. 31 Ann. No. 39–40. pp. 1258–1267.

The authors have observed 340 cases of typhus in two years at Casablanca, and have noted the nervous effects of the disease. Three sets of nervous complications are set forth: (i) those showing the action of the virus on the brain, (ii) those showing the action on the spinal cord, and (iii) those giving evidence of the effect on the peripheral nerves. Some cases illustrative of each of these complications are given in detail. Death is said to be due, not to the brain effects, but to cardiac insufficiency. In fatal cases, circulatory troubles as well as excitement, delirium, or coma are of nervous origin. Convulsive periods occur in severe cases. Paralysis of the intestine and laryngo-typhus, when intense, presage death. The nerve centres and the pia mater of typhus cases are always congested. Where careful histological examination was made, great congestion of the blood vessels of the pia mater and of the grey matter occurred. Similar lesions occurred in the spinal cord. Clear lesions of the nerve cells were not found in the brain or spinal cord. Congestive lesions were localised mainly in the viscera. Serous meningitis may occur. The localisation of nervous complications in the peripheral nervous system is difficult of explanation.

A. P.

WIENER. **Ueber Flecktyphus.**—*Wien. Klin. Woch.* 1916. Jan. 27. Vol. 29. No. 24. pp. 117–119. With 4 figs and 4 charts.

The author gives some of the results that he has obtained on typhus in the infectious diseases hospital at Vinkovci. He points out the uncertainty of the Widal reaction, and notes that in typhus the brittleness of the bloodvessels is very characteristic. The presence of submucous blood extravasation in the intestinal tract in cases of mixed infections is also mentioned. An account of four such cases, with figures of the rashes and the temperature charts, is given. Combating of heart weakness is essential. Caffein injections five or six times daily, ice bags applied to the heart, injections of ergotin or adrenalin if severe bleeding, and very warm baths daily at convalescence are recommended.

A. P.

NICOLLE (Ch.) & BLAIZOT (Ludovici). **Sur la préparation d'un sérum antiexanthématique expérimental et ses premières applications au traitement du typhus de l'homme.**—*C. R. Acad. Sci.* 1916. Apr. 3. Vol. 162. No. 14. pp. 525–528.

The blood serum of typhus convalescents and of animals recovered from experimental infection has preventive properties from the sixth to the tenth day of defervescence, when used for inoculation.

It is difficult to prepare anti-typhus serum, since cultures of the causal agent are unknown. The virus itself has to be used. The conservation of the virus in all the organs of guinea-pigs renders the preparation of sera possible. Immunisation of large mammals, such as horses and asses, by inoculation of emulsions of the spleen and suprarenal capsules of infected guinea-pigs, has been successfully accomplished. Details of the immunisation experiments are given.

The serum of the ass has been used on infected guinea-pigs. Owing to its mode of preparation, it is highly toxic to guinea-pigs in doses greater than 1 cc. It is better to subdivide the dose and to inoculate 0·25 cc. in one day. The action of the serum against the virus is then efficacious.

In the monkey and guinea-pig the simultaneous inoculation of the virus intraperitoneally and of the serum subcutaneously results in no rise of temperature, controls inoculated with the virus alone contracting typhus. The curative power was tested on guinea-pigs alone. If inoculated during the incubation period or at the rise of temperature, the serum stops the development of infection. Inoculated on the first or second days, it stops it rapidly; inoculated later, its action is slow, doubtful or none. The animal in which infection was prevented by precocious inoculation of serum showed no immunity later, so proving the destruction of the virus by the anti-body in the serum.

The action of the anti-typhus serum has been tested on 19 human patients. Five were Tunisians, eleven were French and three were Serbs, all being seriously ill. Ass serum was used exclusively. All the cases were cured rapidly when the serum was used early, but more slowly when the serum was not used till after several days of illness. Defervescence occurred in 24 to 28 hours. In each case, the temperature fell at each inoculation of serum. The pulse and kidneys quickly improved. Nervous symptoms were not influenced so rapidly, but

improved with repeated inoculations. In one hospital 14 patients were cured by serum-inoculation, while two who were not inoculated died. The serum has no toxic action on man, but as a precaution has only been used in weak doses of 10 cc. per day as a maximum. The results seem favourable to serotherapy applied to typhus.

A. P.

RABINOWITSCH (Marcus). **Объ экспериментальномъ сыпномъ тифѣ у морскихъ свинокъ и вакцинаціи противъ него.** [Le typhus exanthématique expérimental du cobaye et la vaccination contre lui.]* 47 pp. 1915.

The author has previously published a number of papers on *Diplococcus exanthematicus* [see e.g., this *Bulletin*, Vol. 2. p. 642]. Various animals inoculated with the blood of patients or with pure cultures obtained from them have contracted typhus, but the guinea-pig was the only animal in which the temperature curve typical of typhus was reproduced. It was therefore selected for further experimental work.

The bacillus, in pure young cultures, had the form of a rod, staining at its extremities with even dilute aniline stains. For cultures, three to five cc. of infected blood was sown on 100 cc. of bouillon-ascitic fluid. For inoculation, five to six cc. of blood mixed with two cc. of a one per cent. solution of sodium citrate was used. This quantity was sufficient for two guinea-pigs. Control guinea-pigs were inoculated with pure blood, three to seven cc. being sufficient for two.

In other experiments, 27 hour cultures on solid media were emulsified and injected intraperitoneally. They killed the guinea-pigs in periods varying from some hours to a day. Only very virulent cultures were inoculated subcutaneously. A table of the results of the experiments is given.

The author gives a full summary, which may be translated thus :—

1. The blood of patients taken at the crisis and cultures of the diplococcus obtained from its culture are virulent for guinea-pigs in the majority of cases. Intraperitoneal inoculation produces attacks in them like typhus in man.

2. The period of incubation, the attack and prognosis of the malady in the guinea-pig corresponds to the virulence and quantity of bacilli inoculated, as well as to the mode of introduction and peculiarities of the animal.

3. The attack may last from one to twenty-eight days, and commences after an incubation period of from nine hours to thirty-seven days.

4. The gravity of the malady in the guinea-pig depends on the severity of the malady in the man from whom the inoculation material was obtained. In some cases, the malady in the guinea-pig may be benign though the virus was virulent, while the reverse has also been observed.

5. The virulence of the blood and of the bacilli obtained by its culture diminishes towards the crisis and sometimes even disappears.

6. In fatal cases the virulence increases steadily as death approaches.

* Translated from a summary in French made by Dr. KEILIN.

7. The serum obtained by decantation, which is as virulent as the blood itself, and blood cultures of the cardiac blood of guinea-pigs taken at the moment of paroxysm, give colonies of the Diplobacilli.

8. The serum passed through a Berkefeld filter has no action on guinea-pigs, and cultures of it are sterile.

9. The blood of guinea-pigs taken at the moment of paroxysm is virulent for clean guinea-pigs. Cultures of it give the Diplobacillus, even in cases where the blood of the patient originally used does not give the organism on culture.

10. The influence of passage through animals on the virulence of the cultures depends on their original virulence, on the length of the stay in the animals and on special circumstances. As a rule, numerous passages increase the virulence of the infective agent.

11. Passage through the body of a child, who is refractory to infection, diminishes the virulence of the pathogenic agent and its power of multiplying on culture media.

12. The reverse is seen in young guinea-pigs, which are more susceptible to infection than the old ones.

13. The diminution of the virulence of the pathogenic agent in cultures commences from the second week after a pure culture has been obtained. After three to five weeks, with numerous transplantings, the virulence entirely disappears.

14. Guinea-pigs do not react to massive doses of weak cultures. If inoculated afterwards with virulent cultures, they show the symptoms of typical typhus.

15. Guinea-pigs that have had the disease become immune and retain their immunity for a long time, up to 421 days being known.

16. Guinea-pigs inoculated with virulent cultures warmed to 60° for half an hour become refractory to new infections. They have kept their immunity up to 208 days.

The author concludes that the pathogenic agent of typhus is the bacillus discovered by him in 1909, which is named *Diplobacillus exanthematicus.* A. P.

PAPAMARKU. **Beiträge zur Serodiagnostik des Fleckfiebers.**—*Cent. f. Bakt.* 1. Abt. Orig. 1915. Nov. 29. Vol. 77. No. 2. pp. 186–197. With 2 charts.

After reviewing briefly the work of a number of previous investigators on complement fixation in typhus and syphilis, the author gives an account of his recent results in cases of typhus. He used alcoholic extract of the organs, 1 gram of organ substance in 10 cc. of alcohol. Both the sera of typhus patients and of convalescents therefrom were tested, and the results obtained are set forth in a series of tables. The main points elucidated were the following :—The complement fixation reaction with alcoholic organ extract as antigen gave positive results in a large percentage of sick and convalescent cases, if fresh, active sera were used. When inactive sera were employed the positive reactions were very few. The greatest number of positive results, using active sera, were obtained in the patients in the second week of the disease, and in patients in the third week if inactive sera were used. Positive results also occurred in convalescents after five weeks' illness. The reaction is considered to form a basis for differential diagnosis between typhus and typhoid in cases where a rash is not present. A. P.

DELTA (Constantin). **Sur la réaction de Wassermann dans le typhus exanthématique.**—*Cent. f. Bakt.* 1. Abt. Orig. 1915. May 14. Vol. 76. No. 1. pp. 50–54.

The author gives a brief, historical account of the attempts made by previous workers to utilise the Wassermann reaction in the case of typhus. During an epidemic of typhus at Alexandria that commenced in January 1914, the author applied the Wassermann reaction in 42 typical cases of typhus. In 19 cases, the test was made during the febrile period and seven of these were positive. The positive results were obtained some days before defervescence. The negative results were in cases tested before the fall of temperature, and were repeated after defervescence and then found positive. Six cases tested on the eve of defervescence gave positive reactions. Thirteen cases could only be tested after the fall of temperature and the reaction was positive in 12 of them. Four patients tested after complete cure also gave positive reactions. The history of some of the cases is given. When the typhus antigen was employed in two cases of pneumonia, four of typhoid, two of mumps, two of variola, and one of acute miliary tubercle, the results were constantly negative. Thus, out of 42 clinically definite cases, the Wassermann reaction was positive in 40. While the reaction was negative at the commencement of the malady, it became almost always positive towards defervescence, and once more became negative after a time that did not appear to be very long (two months perhaps as a maximum). It is hoped that the Wassermann reaction results thus recorded may be of service in the determination of doubtful cases, especially at the beginning and end of an epidemic.

A. P.

OLITSKY (Peter K.), DENZER (Bernard S.) & HUSK (Carlos E.). **The Etiology of Typhus Fever in Mexico (Tabardillo). Preliminary Communication.**—*Jl. Amer. Med. Assoc.* 1916. May 27. Vol. 66. No. 22. pp. 1692–1693.

The work of the authors was begun in February, 1916, at Matehuala, Mexico, but was interrupted in March. Studies on the blood of typhus patients were undertaken in order to ascertain whether a causal organism occurred therein. Three blood cultures were made in a medium containing 0·5 per cent. of glucose, and an organism was recovered in one case. Cultures were also made from the blood of 28 cases, the medium containing 2 per cent. of glucose. Only eight of these cultures could be observed for a sufficiently long time and in all of them the same organism was found.

The organism was an obligate anaerobic, Gram-positive bacillus, identical with *Bacillus typhi-exanthematici.* Cultures of this were pathogenic to guinea-pigs.

In cultures made from lice removed from the clothing of typhus patients, the same organism was found. Infected lice inoculated into guinea-pigs produced febrile reactions, and splenic lesions were found at autopsy. The bacillus was recovered from spleen cultures.

A. P.

Bertarelli (E.). i. **La Lotta contro il tifo esantematico.**—*Morgagni.* 1915. Apr. Pt. 2. Vol. 57. No. 22. pp. 343–348.

ii. **I punti controversi della epidemiologia del tifo esantematico.**—*Ibid.* July 30. No. 37. pp. 585–591.

iii. **Gli insegnamenti della lotta profilattica contro il tifo esantematico.**—*Ibid.* 1916. Feb. 15. Vol. 58. Pt. 2. No. 10. pp. 145–156.

i. The author gives a general account of an epidemic of typhus fever. He emphasises that the disease is transmitted by lice. The excitant of typhus has been suspected to be a Protozoön, but the presence of an organism of this nature has not been demonstrated. The excitant of typhus is probably to be found in the red blood corpuscles and not in the plasma. By experiment it has been found that the incubation period of typhus is up to ten weeks. Guinea-pigs are the only laboratory animals which, when infected with typhus, present the same temperature curve as man. Prophylactic measures must be directed in the first instance against lice. By such measures the epidemics of typhus in Tunis were reduced from 856 cases in 1909 to three in 1914, showing the efficacy of preventive measures against lice in combating typhus.

ii. This paper gives an account of the various controversies relating to typhus fever and more especially to its mode of transmission. In the opinion of the author there is no doubt that the louse is the most common transmitter of typhus. Transmission by the louse is easy and has also been proved. Other ectoparasites may aid in the conveyance of the disease to man. Cases of infection by the inhalation of droplets of sputum of sufferers or by contact with them are possible, but do not account for rapid spread of epidemics. The work of recent investigators is quoted in support of the louse-borne nature of typhus.

iii. This paper contains a useful summary of the prophylactic measures adopted in different countries against lice. The author again states his opinion that lice are the most important source of the spread of typhus. Though the inhaling of infected saliva has been inculpated by some as a means of contracting infection, he thinks it is at any rate very secondary. In combating epidemics of typhus, attention should be concentrated on the eradication of lice, and for prudence sake, prophylactic measures should be instituted against all biting insects. Both France and Germany have adopted prophylactic measures against lice. In Germany sulphur dioxide and "salforkose" have been used. Salforkose contains 90 per cent. carbon disulphide, 10 per cent. water, alcohol, a little formaldehyde and mustard oil. A mixture of 90 per cent. carbon disulphide, 5 per cent. water and 5 per cent. alcohol also can be used. Lice on the body can be destroyed by mercurial ointment. Since March 1915, the Italian authorities have used the following mixture for the destruction of head and pubic lice :—100 parts of petrol, 50 parts of olive oil and 10 pars to of Balsam of Peru. As a preventive of lice, the following mixture is useful :—Oil of aniseed or oil of fennel 30 to 40 parts, alcohol (96 per cent.) 40 to 60 parts. Powder containing 5 per cent. cresol or naphthalene in sachets worn on the body has been of service to the troops.

In March 1915, the Austrian army orders recommended naphthalene in body sachets and the use of a mixture containing 30 to 40 parts of oil of aniseed, with or without bergamot, for freeing the skin from lice. Petrol is of use as it prevents the breeding of lice.

Exposure to compressed steam destroys both the lice and their ova in clothing. The addition of 8 per cent. solution of sulphur dioxide to clothes and body linen is sufficient to kill lice and their ova. A solution of hyposulphite of soda mixed with tartaric acid can be used. Three to five per cent. solution of ammonia can be used on the skin, but will not kill ova. Ten per cent. formalin kills lice rapidly, but it is doubtful if it kills the ova. Acetic acid, sprinkled or rubbed on the body, is useful for destroying lice, and is better if one per cent. corrosive sublimate is added, but is irritating to the skin. Phenol and creolin (5 to 10 per cent. solutions) have also been used and serve moderately well in keeping lice from the skin. Some Austrians consider oil of aniseed good, but opinions differ as to the value of xylol, camphor and creosote.

Benzine merits mention. Its inflammability and somewhat slow action are disadvantages, but its portability, simplicity of application, harmlessness and efficacy (not high but sufficient) commend it. Simple spraying of the body and clothes is not so good as impregnation with benzine vapour. Benzine has been largely used in France. Powdered borax has some effect, but is of little use against lice. Camphor is of some use, either as oil, or in alcohol, or as pomade or powdered. It may serve as a preventive. Chloroform has been recommended as a preventive in Italy and Germany.

Essence of mint may be of use, as it not only kills lice with which it comes in contact, but its odour repels them. It can be used as such, in alcohol, in oil or with lanoline. It irritates the skin when used as essence or concentrated, and the treatment has to be repeated if the ova are to be destroyed. The same is true of pepper and menthol. Mercury in various forms is of use against pubic lice only.

The author mentions various mixtures containing naphthalene, but doubts their efficacy for the destruction of the ova of lice. In war, powders are superior to lotions and pomades. In short, the author advises that lice should be got rid of by any means available.

A. P.

PRIETO. **Un Dato para la etiologia del tifus exantematico.**—*Siglo Med.* 1916. Jan. 8. Vol. 63. No. 3239, pp. 19–20.

The author points out that at the International Sanitary Conference held in Paris during November and December 1903, the first statement that typhus fever was transmitted by lice and by fleas was made by Dr. CORTEZO. The present author quotes the extract containing this statement—made in 1903—from the official records of the Conference. Dr. CORTEZO, who was director of sanitation, made his observations on an outbreak of typhus near Madrid and on the preventive measures taken therein.

A. P.

Book Review.

Howard (Leland O.), Dyar (Harrison G.) & Knab (Frederick). **Th Mosquitoes of North and Central America and the West Indies. Vol. 1. A General Consideration of Mosquitoes, their Habits, and their Relations to the Human Species.**—vii + 520 pp. 1912. **Vol. 2. Plates** [150 comprising 713 figs]. 1912. **Vol. 3. Systematic Description** (In two parts). **Part 1.**—vi + 523 pp. 1915.—Washington: Carnegie Institute. [Price $10.]

Once again, if it be lawful to compare small things with great, the New World has been called in to redress the balance of the Old, for in this full and ripe treatise upon American Culicidae the taxonomic controversies that have disturbed the Culicologists of Europe, since mosquitoes became notorious as extensive carriers of disease, may be expected to find concordance and a settlement, to the advancement of general knowledge, and to the relief and comfort of those whose business with mosquitoes is limited to the comparatively few species that are of serious pathogenic importance to man.

Of the four volumes composing this monumental memoir only three have been published, the fourth, which is to contain among other things the systematic account of the genus *Anopheles*, being still to come. Of the three volumes published the first is of general interest and treats of the structure and natural relations of mosquitoes as insects, as well as of their bearings upon human affairs as disseminators of certain prevalent diseases; the second consists of plates of illustrations, while the third contains a large instalment of the descriptions of American species, and the general taxonomy of the family.

The Introduction to the first volume explains how the work was begun and continued, financially and otherwise. It states with some emphasis that although begotten of medical discoveries and sanitary needs, it is strictly an entomological monograph, which is true enough as regards the first 185 pages, but in respect of the residual 300 pages the definition errs on the side of modesty, since entomology there plays rather the part of chorus in the great tragic dramas of malaria and yellow fever.

In the purely entomological chapters the *Culicidae* are subjected to a scrutiny, close, punctilious, and comprehensive, in every stage of their structure—egg, larva, pupa, and adult—and in their habits, physiological needs, seasonal vicissitudes, and other natural relations in each stage. Apart from its value on the anatomical and biological side, the information here amassed is rich in interest for the sanitarian, particularly in its fulness and definiteness of statement in matters like specific longevity, seasonal prevalence, specific peculiarities in breeding-places, manner of hibernation and aestivation, etc., where exact knowledge is essential to rational and successful sanitary endeavour. The natural enemies of mosquitoes and mosquito-larvae are treated at great length and in full detail, though the authors appear to be of opinion that the only enemies that can be made practically useful are fish.

Mosquitoes in relation to malaria occupies more than fifty pages, some of which are devoted to an account—contributed by Dr. A. Neiva—of the malaria parasites, and to a historical review of the origin, growth, and scientific demonstration of the mosquito-malaria theory. The geographical distribution of malaria is also considered, and a discussion of the unforeseen effects of civilisation shows on the one hand how malaria has disappeared from lands reclaimed by drainage, and on the other hand how certain tracts reclaimed by irrigation have become intensely malarious. The *Anopheles* mosquitoes are treated with the utmost fulness, in their habits and modes of life, hibernation and aestivation, powers of flight, colour sense, breeding places, larval habits, etc. Among unusual breeding places mention is made of the water that collects in holes in trees, the site habitually chosen by *Anopheles barberi* (now considered by Christophers to be synonymous with *A. nigripes* and *A. plumbeus*) and by *A. eiseni*; also of Lutz's discovery of the larvae of *A. cruzii* in epiphytic Bromeliaceae of mountain jungles in Brazil.

"*Aedes calopus*" (as the authors prefer to call *Stegomyia fasciata*) and yellow fever fills more than sixty pages, initiated by a very full account of the origin, proof, and several confirmations of the Stegomyia theory, a full description of the experiments and conclusions of MARCHOUX and SIMOND regarding the possible transmission of the virus by the infected mosquito to its progeny, and reviews of several outbreaks of yellow fever where the efficacy of measures for exterminating or abating Stegomyia was actually demonstrated. The account of the insect itself could not be more complete. Its idiosyncrasies, as well as its habits, are noticed at length. Though thoroughly diurnal it will occasionally bite at night, in a well-lit room. It is so intimately domestic that it prefers human company, and may be packed up with clothes in baggage. Though it will live on sugar it will not ripen its eggs unless it have blood. Though its eggs resist experimental freezing they cannot endure a prolonged low temperature. Nothing is too profane or holy for its brood, from a broken bottle to a font or a piscina. Though it usually deposits its eggs in some artificial site, it may occasionally revert to its supposed ancestral habit of using a hole in a tree. Though the larvae may develop—possibly by resort to cannibalism—in water that is perfectly clean and sweet, they seem to prefer water with a slight taint of sewage, and to be able to stand brackish water, and even—if they have almost reached the pupal stage—a mixture which is half sea-water. Some observers state that soapy water is fatal to the larvae, while others have found the larvae thriving in water brackish with wood-ashes. PERYASSU'S experiments, showing that larvae removed from water and kept upon moist ground for 13 days duly completed their growth and development on being returned to their native element, are quoted.

The geographical distribution of *Stegomyia fasciata* (or *Aedes calopus*), its primeval home, and instances illustrating the manner of its spread by ships and railway-carriages, are all discussed at some length. The authors distinguish between temporary distribution and permanent distribution, the latter being the circumtropical zone where no frosts prohibit breeding. Though GOLDI'S speculations are treated to full consideration the authors adhere to the generally accepted opinion that the original home of the insect was the West Indies and the Spanish Main, whence they think it was carried to Europe in the ships of the Spanish Conquistadors.

Fourteen pages are allotted to dengue and filariasis and the mosquitoes concerned in the transmission of these diseases. Here we find the familiar *Culex fatigans* transformed out of all reasonable compass into "*Culex quinquefasciatus*."

Following these sections on Mosquitoes as carriers of specific diseases comes a monody on the economic losses caused by malaria and yellow fever, e.g. through perpetual sickness, lethargy, and predisposition to other ailments, through depopulation of flourishing tracts, through retarding the development of the wilderness, and by impeding human progress generally. If, as Carlyle's Sauerteig asserts, the Hell of the English signifies mainly the terror of failure to make money, the idea at the back of this chapter is very sound. "Reduced value of real estate" is one of the author's texts that, rightly expounded, might have consequences.

In 74 pages the principles and practice of the control of mosquitoes are most attentively and most exhaustively examined. For adult mosquitoes, nets, traps, repellent applications, fumigants, trees and plants credited with deterrent qualities are all discussed with the most assiduous regard. For larvae, drainage and methods of dealing with breeding places, larvicides, and the employment of natural enemies are described and debated with the same fulness and scrupulous attention to detail. ROSS'S terse summary of the objects of anti-mosquito measures is quoted as it stands, and finally some classical examples of successful operations against disease-carrying mosquitoes, on the large scale, in America, Japan, Algeria, Ismailia, and Italy, are given to point the moral.

Of this admirable first volume, however, this one adversative criticism must be whispered—that outside the purely entomological sections it is sometimes tedious and flat, owing partly to the inclusion of prolix and often irrelevant context in the abounding quotations and partly to a proneness to reiteration, and also that in places it is somewhat diffuse

and disjointed. But whether this is the inevitable consequence of plural authorship, or whether it merely illustrates the argument that :—

"When workmen strive to do better than well
They do confound their skill,"

it does not diminish the solid value of the book for purposes of reference.

The second volume is composed of plates of illustrations, the 44 plates of larvae, the three plates of eggs, and the three of pupae—all in each case magnified—and the beautiful plate of *Anopheles* wings, being of superlative artistic excellence. Besides these there are 39 plates (268 separate figures) of male genitalia and 58 plates (396 separate figures) illustrating specific features of larvae.

In the third volume Messrs. Dyar and Knab unfold their system, which is distinguished by its sagacity and simplicity. The likenesses and unlikenesses by which the species are sorted and segregated are not seized promiscuously from inspection of the adults alone, but are discreetly sought for through all the independent stages of the insects' existence, and as the authors have a very good eye for deep-seated resemblances, and a very critical discernment in resemblances that are merely adaptive and superficial, and as moreover a large proportion of the material from which their classification is built consists of adults associated with determinate larvae, it is probable that their system comes as near the ascertainable order of nature as can be expected.

They include the *Dixidae* with the *Culicidae* and arrange the family thus enlarged in three subfamilies—*Culicinae*, *Corethrinae*, and *Dixinae*. In this course they are in accord with a suggestion of Professor WILLISTON which has already been adopted by Mr. EDWARDS, and approved by others.

The *Culicinae* are next grouped in two divergent series—*Culicini* and *Sabethini*—separated by differences which are manifest in the adult, in the pupa, and in the larva. At first I was rather inclined to cavil at this arrangement, but a larger acquaintance with Sabethini, recently acquired, has convinced me that the author's inference, that the difference between *Culex* and *Sabethes* lies deeper down, or further back, than the more specious difference between *Culex* and *Anopheles*, is a sound one. The chief group-characters of the *Sabethini* are as follows :—In the adult : a pair of coarse occipital bristles projecting horizontally forwards between the eyes, *together with* a wisp of hairs on the after part of what has commonly (though erroneously the authors say) been called the metanotum, and no bristles on the field of the scutum. In the larva : no brush on the mid-ventral line of the 9th abdominal segment, this brush being represented by a pair of lateral hairs or hair-tufts. In the pupa : remarkably small terminal paddles, and remarkably large tufts at the angles of the 7th and 8th abdominal segments. As regards habits and occurrence in nature, the *Sabethini*, which are essentially tropical, lay their eggs on leaves, and the larvae inhabit water collected between leaves, or bracts, or more rarely in holes of trees, the amount of water being sometimes very scanty.

The authors recognise four distinct alliances among the *Culicini*, to wit Dinoceritines, Culicines, Megarhines, and Anophelines. The Dinoceritines have long pilose antennae, with the second segment peculiarly elongate, in both sexes (antennae, in fact, like *Dixa*) ; they are crab-hole mosquitoes (though not the only mosquitoes that breed in crab-holes) and are restricted to the coasts of Tropical America and the West Indies. Of American Culicines the authors distinguish only 11 genera, and are somewhat diffident of the rank of some of these. The Megarhines are coincident with the genus *Megarhinus*. In the Anophelines two genera are included namely *Anopheles* and *Coelodiazesis* (=*Anopheles barberi*).

As regards its descriptive part this third volume includes the Sabethini and five genera of Culicines, namely *Culex*, *Carrollia*, *Lutzia*, *Culiseta*, and *Mansonia*.

As illustrations of the authors' comprehensive and consistent style of treatment, the genus *Culex* and the species *Culex pipiens* may be selected, all the other genera and species being treated uniformly, as far as possible, on the same plan.

In the case of the *genus* a full synonymy is given, from the tenth edition of the System of LINNAEUS in 1758 to EDWARDS in 1911. Then comes a

terse generic diagnosis of adult and of larva, and a statement of the geographical distribution of the genus. This is followed by a critical review of the history, limits, and constitution of the genus, and by general remarks upon structural characters, habitat of larvae, egg-laying and eggs, habits, duration of life, etc. Next follows a synoptic table of the American species relevant to the authors' geographical limits.

In the case of the *species*, after the synonymy comes the original description of the Linnean type, and original descriptions of each one of the several species now relegated to the list of synonyms. There follows a sufficient description of the female, the male, the larva, the pupa, and the egg. Finally the species is discussed and criticised as regards its occurrence, habits, breeding-places, distribution, etc.

To praise a work which represents the matured experience and reflection of many years and carries on every page the hall-mark of thoroughness were indeed "wasteful and ridiculous excess," but congratulations at least may be freely offered to Messrs. Howard, Dyar and Knab for having accomplished what must be the highest endeavour of the zoological systematist—which is to search out, lay open and arrange natural facts so that they can easily be understood, verified, and made use of by all men.

A. Alcock.

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